THE RELATIONSHIP BETWEEN ACADEMIC SUCCESS AND AN EARLY INTERVENTION CURRICULUM OF CHILDREN WHO ARE DEAF

By

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The purpose of this study was to investigate the effectiveness of early home intervention curricula in aiding and predicting future academic achievement levels of deaf children. Specifically, this study addressed the following two questions.

1. Will deaf children who participated in early home intervention curricula demonstrate different academic achievement at the beginning of regular schooling from children who had no home intervention curricula?

2. If differences in academic achievement were found, what was the direction of that difference and rate of change of that difference in the above two groups?

The research project was conducted at the Florida School for the Deaf and the Blind (FSDB). Students enrolled in the

Elementary Department were targeted as the population of the study.

Data were collected by a file review and the Test of Early Reading Ability--Deaf or Hard of Hearing (TERA-D/HH). Sixteen students age 4 through 12 were selected for this testing based on variables such as age of child, age of mother at birth of child, race, degree of hearing loss, gender, IQ, and early intervention history. The students in both groups (early intervention vs. no early intervention) were demographically equal and the only difference was the early home intervention treatment.

The study indicated a strong correlation between the application of an early intervention curricula (SKI*HI) and the academic achievement of deaf children at the beginning of regular schooling. The increase in academic achievement was statistically significant [at the .05 level] for the early intervention group.

The major conclusion based on Research Question 1 was deaf children who experienced early home intervention scored higher than children who had no home intervention curricula.

The major conclusion based on Research Question 2 was that a strong positive correlation existed between early intervention and academic achievement. Students with the early intervention treatment increased in academic achievement. The practical implication of this finding is that early intervention does increase academic achievement of deaf children.

CHAPTER ONE

THE PROBLEM AND ITS SIGNIFICANCE

Introduction

Timely application of early intervention curricula to the lives of children who are handicapped is crucial, according to research conducted at early intervention institutions, research centers, and universities (Clark, 1979; Garland, Stone, Swanson, & Woodruff, 1981; Watkins, 1984). These agencies developed intervention strategies that were designed to mitigate or prevent the deleterious effects of handicaps on young children.

In 1981, the National Committee for Services to Very Young Children with Special Needs and Their Families made a report on early intervention for the handicapped. This committee indicated that one of highest priorities of early intervention was research into the long-term effects of early intervention on children (Garland et al., 1981).

One in 1500 children is born with a hearing impairment (Clark & Watkins, 1985). This disability is particularly damaging to the deaf child during the first few years of life when language acquisition occurs (Clark & Watkins, 1985; Watkins, 1984).

Bloom (1964) stated that up to 50% of adult intelligence is determined by the age of four, and deaf children are in a rather irremediable situation unless early intervention is undertaken. A. H. Streng (1967) stated:

> it leaves us in a rather hopeless situation unless language learning is seriously begun . . . before the age of two . . . the greater the delay in learning to communicate, the greater the delay in the more formal aspects of education and the more difficult is the task for both teacher and child (p. 128).

Intellectual and emotional processes are particularly vulnerable to disruptions during the early months. These processes include sensory perception, language development, creative and abstract thinking, the ability to undergo significant interpersonal relationships, and the ability to set long-range goals (Schlesinger, 1985).

An exigent period in language learning occurs during the first two to three years of life (Boothroyd, 1982; Lennenberg, 1967). After this time, learning language becomes more difficult (Pollack, 1970). Once the critical period passes, effective utilization of input abates (Caldwell, 1979). Sensory input deprivation during the first two years of life results in complete inability to perceive speech sounds (Northern & Downs, 1974).

Deaf children, as well as other children, are predisposed to acquire a language (Chomsky, 1980; Grant, 1987) and need intervention to experience the function of language and to observe the content as it is matched to experiences by the parents or teachers. Language intervention during the first two years of life is essential if the deaf child is to optimally develop language skills (Northern & Downs, 1974). Interventions in the first two years of life inevitably influence all subsequent development. White (1975) states that it may be already too late to begin natural language development in a deaf child above the age of two.

There is no way that any hearing-impaired child identified at a later age can, even with the best of follow-up services, counterpoise for that from which they have been unnecessarily deprived (Harris, 1981). Even when hundreds of thousands of dollars are spent on a deaf child's education, the deaf child will fall behind a hearing child of the same age at an escalating rate each year (Johnson, Liddell, & Erting, 1989). Allen (1986) demonstrated that for each year of school, deaf children fall further behind their hearing peers in reading achievement. Thus, early intervention exerts a consequential influence on the development of deaf children as these children are unable to use the same communication process (oral/aural) as hearing children.

Fortunately, recent developments make it possible for deafness to be accurately diagnosed immediately after birth (Davis, 1985). Early diagnosis makes it possible for intervention to take place as early as possible in life. The problem is that parents of newborn deaf children must pass through the grieving process before they can deal with the situation objectively and in a timely manner (N. R. Stavropulos, personal communication, October 1, 1992). Another problem is that some parents may adjourn intervention until the child is old enough for pre-kindergarten or pre-school programs (J. E. Murchison, September 11, 1990; N. R. Stavropulos, personal communication, October 1, 1992).

In 52 reviews of results of early intervention on children who are disabled, almost all (94%) inferred that early intervention results in substantial immediate benefits for handicapped, at-risk, and disadvantaged children (White, Bush, & Casto, 1986). White et al. (1986) identified specific benefits which included cognitive, academic, social, and attitudinal growth for the target child. Of those 34 reviewers who considered the long-term effects of early intervention, 14 (41%) concluded that the gains attributable to early intervention programs are sustained. Six (18%) concluded that gains are not maintained and 14 (41%) concluded that there was not sufficient evidence to draw conclusions (White et al. 1986).

Preliminary evidence of long-term effects also points to both the success and failure of early home-based intervention programs on the development of deaf children (Clark, 1979; Covert, 1984; Watkins, 1984; Watkins & Parlin, 1988). In one promising study, deaf children who went through the home intervention curriculum scored statistically higher than children in a control group on several outcome variables (Watkins, 1984). A more recent study (Musselman, Wilson, & Lindsay, 1988), however, indicated that early intervention produced only short-term gains. The researchers reached a conclusion "... we must ask why early intervention continues to receive widespread support ..." (p. 228).

Studies have converged on the longitudinal growth of children who are disabled on a variable such as reading-achievement growth (Badian, 1982; Butler, Marsh, Sheppard & Sheppard, 1982). Reading achievement growth is predictable for regular students as Badian (1982) found total reading scores on the Stanford Achievement Test (SAT) to be predicted reliably by verbal skills tests given five years earlier. Fletcher and Satz (1982) showed that the Metropolitan

Achievement Test retained significant predictive validity after seven years for students who were first tested during kindergarten.

A common belief among those in printed and audio media is that if one succeeds in accelerating development through early intervention, one will succeed in having a child with a higher level of sensory system functioning for years to come. It is believed this will create a more intelligent child (Korner, 1989). Intervention which stimulates a defective sensory system can induce the functioning of other sensory systems which are not fully developed. A celeritous rate of sensory system development will not assure that the child will have a higher level of learning or improve the parent-child interaction or deepen the parent-child relationship in the future. Korner (1989) insists that even if there are no short-term effects, intervention improves the quality of life which is a worthwhile goal.

The National Committee for Services to Very Young Children with Special Needs and Their Families has made research of early intervention one of their top priorities. They were especially interested in whether or not early intervention has a long-term influence on the sensory and intellectual growth of children who are disabled (Garland et al., 1981). Educators of children with disabilities are concerned whether the same continuity and predictability of achievement growth can be demonstrated for their students (Wolk & Allen, 1984) as little or no research has reconnoitered the longitudinal achievement of students with handicaps.

Early intervention has a beneficial influence on academic achievement. This influence on the development of the perceptual, motoric, and linguistic domains will affect academic achievement.

The premise is that performances in these areas at kindergarten age may give an indication of how the child will perform in reading at a later level of development (Sheppard & Sheppard, 1982). This theoretical premise should be deemed appropriate because language learning is basically a cognitive function and cognition is a function of the brain. Children with even profound hearing losses have intact cognitive capacities for processing language (Lee, 1985).

This study focused on the long-term effects of early home intervention programs for hearing impaired children in their pre-kindergarten and elementary years, to determine whether their academic achievement correlated with the effects of the early intervention curricula. The author's literature review up to 1993 indicated that only two studies (Musselman, Wilson, & Lindsay 1988; Watkins & Parlin, 1988) have been done on the long-term effects of home-based early intervention curricula on deaf children.

Given that deaf children exposed to the full early home intervention curricula are superior as measured by initial achievement tests and longitudinal studies to children without early home intervention, this study should show their performance at each elementary grade to be causally related. This is assuming that reading-comprehension achievement results are as predictable for deaf students as for regular students. The testing instrument in this study, the Test of Early Reading Ability--Deaf or Hard of Hearing (TERA-D/HH) was normed on 1146 hearing-impaired students from 29 states and the District of Columbia (Reid, Hresko, Hammill, & Wiltshire, 1991).

Sheppard and Sheppard (1982) indicated that the child progresses through stages of development in the perceptual, motoric, and linguistic domains. These development stages allow reading comprehension achievement tests to be used to predict future success in academics. This assumption is that performances in these areas at kindergarten age may give an indication of how the child will perform in reading at a later level of development. In most validity studies, the longer the time interval between the collection of the predictor and criterion variables, the poorer the prediction. Consequently, it is particularly interesting that the reading scores grow more predictable with the passage of time (Clark, Bruininks, & Glaman, 1978).

It should be possible, accordingly, to obtain the Sensory Impaired Home Intervention (SKI*HI) exit test (N. R. Stavropulos, personal communication, November 11, 1991) given to deaf children completing early home intervention curricula and predict their academic achievement for the next several years. In evaluating the predictive validities of achievement tests, Antonak (1988) found that second- and fourth-grade scores on the reading comprehension subpart of the SAT correlated .83. This is strong statistical evidence for the presence of a factor that explained early grades to later grades achievement correlation. It was suggested that this factor reflected general scholastic ability.

The TERA-D/HH correlated .78 with the Wechsler Intelligence Scale for Children-Revised (WISC-R). This information indicates that the TERA-D/HH is a reliable and valid measure of reading (Reid, Hresko, Hammill, & Wiltshire, 1991) which is essential for general scholastic ability.

Educators working with children with handicaps are concerned whether this same predictability and continuity of achievement growth can be demonstrated for exceptional students. Standardized achievement measures applicable to regular students may have limited usefulness for exceptional students (Wolk & Allen, 1984). However, it was demonstrated that the reliabilities for the TERA-D/HH were between .94 and .95 using the Coefficient Alpha. The Coefficient Alpha is also known as Content Sampling. Content Sampling pertains to the degree of homogeneity among total test and component items. A test is more homogeneous or internally consistent when the items are highly related. The TERA-D/HH has excellent reliability for the hearing-impaired student population from age 3 to 14 (Reid, Hresko, Hammill, & Wiltshire, 1991).

In disagreement, a long-time educator of the deaf found that any test involving language is unfair because lack of language is the main handicap of the hearing impaired (Brill, 1977). His contention implies that the TERA-D/HH is not reliable for deaf students as the correct answers a hearing child gives represent a very small sample of that child's total language. On the other hand, a deaf child's correct answers on a standardized test represent a high percentage of this child's total language.

To avoid giving the same test twice to a child, parallel forms of tests are given. If a child is tested with form A and then retested with form B, ideally, his or her scores should be nearly identical.

This has proven unreliable with deaf children. Their scores may vary by 2 or 3 years when tested on two successive days with parallel forms of the same test. If one form of the test is given at the beginning of a learning period and a parallel form given at the end, the difference in the scores will not reflect a true measure of the child's learning.

Examples of why this happens were offered by Brill (1977). If one form of the test used the word "pail" and the parallel form used the word "bucket", the two terms would probably be equivalent to a hearing child but not to a deaf child.

The TERA-D/HH was designed to prevent different scores from hearing impaired children taking Form A or Form B. The coefficient depicting the TERA-D/HH stability reliability was found to be .88, a significant statistic that exceeds minimal requirements for reliability (Mehrens & Lehmann, 1987).

Purpose of Study

The purpose of this study was to investigate the effectiveness of early home intervention curricula in aiding and predicting future academic achievement levels of deaf children. Specifically, this study addressed the following two questions.

1. Will deaf children who participated in early home intervention curricula demonstrate different academic achievement at the beginning of regular schooling from children who had no home intervention curricula?

2. If differences in academic achievement were found, what was the direction of that difference and rate of change of that difference in the above two groups?

Definition of Terms

For the purpose of this study, the following terms are defined.

American Sign Language is a language used by deaf people with syntax different from English. Signs, classifiers, facial expressions, body shifting, and gestures are used to express concepts.

Amplification is the use of wearable hearing aids used in one or both ears.

An Auditory Skills Development Curriculum is a systematic step by step auditory development program which is modeled for the parents for their use in the home.

Center Based intervention is early intervention taking place in a central location such as a school where professionals work mainly with the child using auditory skills development, communication and language curricula.

Communication Curriculum is the full range of oral/aural and visual/gestural communication program from which the parents can select for use with their child.

Degree of Hearing Loss is classified as normal, slight, mild, moderate, severe, and profound. Speech can be understood in slight and mild losses. In moderate loss, many speech sounds cannot be discriminated, especially the crucial consonants. Severe and profound losses do not permit any recognition of speech sounds.

Early Intervention is the presentation of an amplification, audiology, communication and language curricula to the parents with the intent of the parents stimulating language development by using these intervention curricula with the deaf child.

Early Intervention Curricula are materials provided to parents in order to teach them how to provide auditory and language stimulation for their child at home.

Fingerspelling is where letters are formed by various handshapes to express a concept in fingerspelling. Each word is presented/spelled letter by letter.

People who are Hearing-Impaired have a mild (35 dB) to profound (110 dB) hearing loss bilaterally. Individuals who are deaf or who are hard of hearing are collectively considered to be hearing impaired.

HTL is Hearing Threshold Level. This is the level where sound is detected during a hearing test.

Home Based early intervention is early intervention taking place in the home where professionals work with parents using curricula in auditory skills development, communication and language so the parents can teach the child.

Hospital/Home-Bound Education is education that takes place in a hospital or home setting for a student who cannot participate in programs involving contact with other students.

Language Curriculum.is a receptive and expressive program which provides specific receptive and expressive language activities that parents can do in the home.

Least Restrictive Environment is the placement of the child with a handicap in a barrier-free setting.

Longitudinal Effects are the effects of time on academic achievement of hearing-impaired children.

In the Mainstreamed Class placement, at least 80% of the deaf child's education is in a regular class placement. Often, the only extra help the child receives is the utilization of a sign language interpreter. The child may receive special education and related services for 21% or less of the school day.

The Normal Curve Equivalent is a transformation of the raw score into a standard score with a mean of 50 and a standard deviation of 21.06.

The Oralist Method is the communication philosophy which relies mainly on lipreading and the use of amplification and residual hearing.

Pidgin Signed English is a combination of American Sign Language and English where conceptually accurate American Sign Language signs follow English rules of grammar.

The Quotient Score is a transformation of the raw score into a standard score that is based on a distribution having a mean of 100 and standard deviation of 15.

A Residential School is a boarding facility where children attend classes on campus or attend some off campus classes. Usually, most of the students live at the school at least five days a week with some students living in the community and enrolling as day students.

In the Resource Room Placement, the deaf child receives special services from at least 21% up to 60% of the school day.

In Signed English, signs are used following English structure. There are many variations such as Manual English, Signing Exact English, Signing Essential English and Linguistics of Visual English. Some approaches emphasize making visible prefixes and suffixes while others incorporate more American Sign Language principles.

SKI*HI is an acronym for “Sensory Impaired Home Intervention”. It is the only early intervention program for hearing-impaired children to be approved for national dissemination by the Joint Dissemination Review Panel of the U.S. Department of Education (Watkins, 1984).

TERA-D/HH is an acronym for Test of Early Reading Ability--Deaf or Hard of Hearing.

Total Communication is the full spectrum of language modes such as gestures, formal sign language, speech, speechreading, fingerspelling, reading and writing.

Total Inclusion is the commitment to educate each handicapped child, to the maximum extent appropriate, in the school and classroom he or she would otherwise attend.

Delimitations

This study had the following delimitations.

1. All subjects in this study were hearing impaired students.

2. Only students attending a residential school for deaf persons in Florida were included in this study.

3. The effects of early intervention on deaf students in mainstreamed programs were not evaluated, nor was the

appropriateness of placement of deaf students into a residential school environment judged.

4. Academic achievement was measured by the TERA-D/HH.

5. All students were classified as deaf according to the school's guidelines.

6. All students were aged 4 through 12.

7. This study included only students whose parents had given permission to be tested.

Limitations

This study was limited by two conditions.

1. The residential school involved with Project SKI*HI (an early intervention program for hearing-impaired children) may not be representative of other hearing impaired programs.

2. The students had been identified as being deaf according to the decision of the placement teams at the school.

Justification of the Study

From the inception of Public Law 94-142, educators have debated whether deaf children should be in special programs or be mainstreamed. Deaf children are often placed in special programs because achievement levels of many deaf children are low, with up to a 33-month lag in reading by first grade not being unusual (Ewing & Ewing, 1971).

Intensifying this problem is the fact that 92% of these children (Johnson, Liddell, & Erting, 1989) are from all-hearing families.

Ninety-six percent of these parents are unable to communicate effectively with their own deaf children (Mendelsohn, 1982).

By the time deaf children without early intervention are adults, many are functionally illiterate (Moores, 1987). Seventy-two percent of the working-age deaf population of Florida are unemployed (Conner, 1992). Apparently, the present educational system is not able to achieve the objective of the national education goals which stated that by the year 2000, every adult American will be literate and possess the knowledge necessary to compete in a global economy (National Goals for Education, White House, 1990).

In an attempt to rectify low achievement levels of deaf children, many administrators have tripled their budget in relationship to student enrollment (American Annals of the Deaf, 1990). Some education programs in Florida, for instance, were spending up to $43,000 per child per year for a significant portion of their deaf students (Proctor, keynote speech at faculty meeting, Florida School for the Deaf, August 27, 1990). In spite of this, data from the Demographic Studies for the Deaf (Johnson, Liddell, & Erting, 1989) indicate that the average deaf child progresses less than one month per year in reading and language achievement. Thus, the average deaf child falls behind eleven months each academic year.

Researchers (Clark, 1979; Watkins & Parlin, 1988; White & Watts, 1973) have stressed the importance of early intervention with deaf infants. As White stated, “It is all over by age three; kids start to lose potential after their first birthday” (White & Watts, 1973).

Watkins and Parlin (1988) reported that only one study has been done on the long-term effects of home-based programming on hearing impaired children. Since the only two longitudinal studies ever done (Musselman, Wilson, & Lindsay 1988; Watkins & Parlin, 1988) reached contradicting conclusions, it is even more necessary to determine the effects of early intervention curricula on the academic achievement of deaf children.

A longitudinal study (Musselman, Wilson & Lindsay, 1988) involving all identified deaf children in Ontario failed to show evidence of lasting gains associated with intervention. In this study, children were first tested when they were between the ages of three and five and were tested again within four years. The researchers stated "Given this pattern of findings, we must ask why early intervention continues to receive widespread support within the educational community" (Musselman, Wilson & Lindsay, 1988, p. 228).

Comparing the academic achievement of deaf children having had the early intervention treatment to the academic performance of deaf children without early intervention may give a more complete picture of the efficacy of home-based early intervention curricula. With this determination, more appropriate planning and delivering of programs for deaf children may result.

A demonstrated ability to predict future achievement levels immediately after completion of the early intervention curricula should assist in the implementation of future early intervention curricula. If early intervention for deaf children does result in improved academic achievement, every dollar invested in this program can return up to five times that amount because of lower costs in special education, public assistance, and criminal justice activities, as demonstrated by other early intervention programs (Committee for Economic Development, 1987).

Gerber (1977) reported that detection and habilitation of one deaf infant can be shown to be less than the cost of later rehabilitation. Mencher (cited in Gerber, 1977) deduced that each year of earlier detection saves $10,000. The U.S. House Select Committee on Children, Youth and Families estimated that every dollar invested in early intervention returned six dollars to society, by reducing later educational, crime, and public assistance costs (U.S. Congress, Select Committee on Children, Youth and Families, 1989). Every dollar invested in early intervention saved seven dollars to society (Smith & Strain, 1988).

Early intervention programs result in lower costs in special education, public assistance, and criminal justice activities involving their graduates (Barnett & Escobar, 1988; Smith & Strain, 1988). Legislators are scrutinizing budgets with unusual care, and documentation of the effectiveness of programs and their immediate and long-term effects can be highly persuasive (Guralnick, 1991).

Methodology

The purpose of this study was to investigate the effectiveness of early home intervention curricula in aiding and predicting future academic achievement levels of deaf children. A review of the literature revealed that there is a time window of optimum language acquisition and that the application of early intervention curricula resulted in immediate benefits. Only two long term studies were done. Therefore, this investigation was an attempt to advance this topic of research and to extend earlier findings to an older population of deaf people.

To obtain insight into achievement results of deaf students, deaf children from the Florida School for the Deaf and the Blind (FSDB) age 4 through 12 were selected to determine the effects of early intervention curricula on achievement. These children age 4 through 12 were given the TERA-D/HH test.

This study followed experimental research procedures to examine the longitudinal effects of early home intervention curricula on the achievement of deaf children on the TERA-D/HH. This section is divided into six units: subjects, treatment of intervention children, setting, instrumentation, procedures, design, and data analysis. The methodology is explained in further detail in Chapter Three.

Subjects

The subjects consisted of deaf children age 4 through 12 who were enrolled in the FSDB, which is a residential school. All of the children have deafness as the only primary handicap and have no other known exceptionality labels.

The eight experimental subjects were children who completed the SKI*HI curriculum and attended the school for the deaf. All of these students were 4 through 12 years old.

An equal number of control group students were selected by matching these students with the variables of the experimental group. These groups shared the same characteristics such as degree of hearing losses, age, race, gender, and intelligence.

Treatment of Intervention Children

When a child is suspected as being hearing impaired, audiological testing should be done to confirm suspected hearing impairments. In Florida, cooperation with audiological, medical, and educational personnel and extensive awareness campaigns ensure early identification and audiological testing (C. Mankinen, personal communication, December 8, 1992).

All deaf children enrolled at the FSDB receive amplification, auditory, communication, language, and academic services (C. Dufresne, personal communication, February 23, 1993). All deaf children who are able to benefit from amplification are fitted with hearing aids. The children are taught how to discriminate sounds ranging from loud environmental sounds to speech. In Florida, this was done before enrollment at the school in the SKI*HI intervention. Hearing impaired children receiving early intervention services through the SKI*HI program were appropriately amplified prior to enrollment at the FSDB.

The children were enrolled in academic programs using communication methods appropriate to their residual hearing. Language was taught using Pidgin Signed English. Deaf children were exposed to visual communication as given by SKI*HI communication and language curricula before entering school at Florida.

Setting

The research was conducted at the FSDB in St. Augustine, Florida. This School was identified as being involved in the SKI*HI program (S. Watkins, personal communication, April 27, 1989).

Instrumentation

The dependent variable in this study was the quotient score of the TERA-D/HH. This test was administered to all of the subjects during a two week period at the beginning of the school year.

This test is the only individually administered test of reading designed for students with sensory hearing loss. It is also the only test normed on deaf and hard of hearing children younger than 8 years old. The quotient scores were used as the dependent variable.

Design

This was a relationship study. Use of a causal-comparative method of exploring relationships between variables allowed the researcher to look at the effect of SKI*HI curricula on reading comprehension scores of deaf children. The causal-comparative method is an accepted technique used by researchers to explore causal relationships among variables that cannot be manipulated experimentally (Borg & Gall, 1983). Deaf children age 4 through 12 who had received SKI*HI intervention treatment earlier in their lives were compared to deaf children who had not received the treatment.

Since treatment was studied after it exerted its effects on the children at the FSDB, the design of this study is similar to the

Campbell and Stanley (1963) ex post facto design. In this study, treatment was given as the application of the SKI*HI curricula.

This causal-comparative model facilitated the purpose of this study and is most realistic given the limits of the population available. Access to the student files was granted to the researcher by the FSDB by the school's Principal (Appendix A). Permission (Appendix B) to administer the TERA-D/HH instrument was obtained from students' parents. The dependent and independent variables were collected on all children from age 4 to 12 who completed the SKI*HI curricula.

A *t*-test and a Pearson product-movement correlation coefficient was used to analyze the differences between the experimental and control groups on the quotient scores. The *t*-test is the most common statistical procedure for determining the level of significance when two means are compared (McMillan & Schumacher, 1984).

Procedures

Data for the study were collected with two instruments: (a) the student files from students who were 4 through 12 years old, and (b) the Test of Early Reading Ability--Deaf or Hard of Hearing (TERA-D/HH). The student files contain family history, medical information, test protocols, and test results. Student files were opened and the following information were recorded: age of child, age of mother at birth of child, race, degree of hearing loss, gender, IQ, and early intervention history (Appendix C).

A schedule was set up for testing. The children were tested from 3 P.M. to 5 P.M. in a quiet office in a dormitory. The children were tested at 30-minute intervals and 2 to 4 were tested each day. The entire testing process was done within a 2-week period in late August and early September of 1993.

Data Analysis

The purpose of this study was to investigate the effectiveness of early home intervention curricula in aiding and predicting future academic achievement levels of deaf children. The researcher considered the relationship between each of the seven variables as found in the students' files and the quotient scores of the TERA-D/HH instrument. The purpose was to determine the relationship between these variables and the quotient scores.

The researcher employed descriptive statistics and nonparametric statistical analysis to analyze the data. Means and frequency distributions were used to describe the independent variables. An one-way analysis of variance was used to determine relationships between each of the independent variables and the quotient score of the TERA-D/HH.

The dependent variable was subjected to a multiple regression analysis with age, age of mother at birth of child, gender, race, degree of hearing loss, IQ and history of intervention as independent variables. A forced entry model was used, with the independent variables entered one at a time in the order listed.

Organization of the Study

The remainder of this study will be reported in four chapters. In the next chapter, a review of the literature is presented. In Chapter Three, the population is described, along with data collection procedures and a description of the data analysis instrument. In Chapter Four, demographic information is given and the results of this study are reported and, in Chapter Five, the results are discussed.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

Introduction

Presented in this chapter are the results of the literature review related to deafness and education of deaf children. The literature reviewed in this section is paradigmatic of a broad range of topics related to the development of deaf children. The review of the literature is presented in three parts.

The first part consists of education of the deaf. Here, the effects of early language deprivation on education is manifested. The second is converged on the influence of intervention. The influence of early intervention on disabled children is substantiated to be more time sensitive for deaf children than disabled children in general. In the third part, the SKI*HI Intervention Model is introduced.

Education of the Deaf

Aristotle presumably believed that deaf people could not talk and could not benefit from education. Deaf people were classified with mentally incompetent people by Roman law. In the sixth century A.D., the Justinian Code denied deaf people the rights and obligations of citizenship (Hallowell & Silverman, 1966).

It was not until 1525 that serious efforts were made to educate deaf children. This was done by Pedro Ponce de Leon, who taught deaf children of the nobility. In 1817, the first permanent public school for deaf children in the United States was established, at Hartford, Connecticut (Hallowell & Silverman, 1966). Today, the Individuals With Disabilities Education Act (IDEA) mandates that deaf children, as well as all other children with disabilities, shall be provided a free and appropriate public education (Individuals With Disabiltiies Education Act Amendments, 1991).

In the United States, deafness is the single most prevalent chronic disability. Of all the areas of disability, deafness is likely to be the most confusing and controversial (Freeman, Carbin & Boese, 1981). It is commonly known that if all the deaf people in the world were brought together to form their own country, it would be the third largest country in the world (Hale, 1991). Consideration given to this group is not justified by the numbers of persons afflicted. Data on the incidence and prevalence of deafness has not been gathered as often and as carefully as information on far less common health problems (Schein & Delk, 1974).

The problems deaf children have create other issues such as language deprivation. Deprival of language increases and magnifies deaf children's problems (Davis & Silverman, 1978). If the deaf child is a problem to his parents, the parents most often are the problem for the child (Gruenberg, 1939 & Mendelsohn, 1982). Initial reactions to having a deaf child in the family are not often resolved (Mendelsohn, 1982) by the family. These responses continue to exert a retarding influence on the deaf child (Mindel & Vernon, 1971). Unless parents are shown how to give their deaf children help, these children will withdraw from educational opportunities and people (Davis & Silverman, 1978).

Parents are often given confusing or conflicting advice pertaining to their deaf child. This is because the capacity to speak is so closely associated with communicating, thinking, and intelligence. Parents are told to treat their deaf child as normal. They also believe that science will someday have an answer to all of their problems (Freeman, Carbin & Boese, 1981).

The major contention in education of deaf children still is what techniques of communication (oral, fingerspelling, and/or sign language) should be used with the deaf child. These different procedures to communication can profoundly impact every area of family life: family communication; selection of educational programs; and whether friends should be deaf, hearing, or both (Freeman, Carbin & Boese, 1981).

Parent involvement is an integral part of the deaf child's development. This is not easy when conflicting advice creates uncertainty and lack of confidence. Some parents avoid this uncertainty by adherence to one specific approach or to one expert's advice. Deaf children cannot be treated in this way because most hearing people, including some professionals, have little but ignorance to depend upon in their approach to deafness (Freeman, Carbin & Boese, 1981).

Due to the diverse opinions held by professionals in deafness, parents of deaf children are often presented simultaneously with a variety of communication options: oral language, gesture language, signed and/or fingerspelled language, and written language. With deaf children, the types of linguistic structures and processes in one option are not transferable to another option. In addition, deaf children are subjected to different communication alternatives daily. One option may be used in the classroom, another on the playground, another in the dormitories, and still another in the home. As a result, comparative studies on communication options reveal that all deaf children are significantly below the performance of normally hearing children of the same chronological ages (Kretschmer & Kretschmer, 1984).

Psychologists have studied the substandard language development of deaf persons so thoroughly that they are able to quantify with confidence the anticipated lag in educational achievement at various points. The average deaf student is said to be retarded by from two to five years on various measures of language achievement. Achievement test data places vocabulary levels of deaf students up to nine years behind hearing children (Gentile, Schein, & Haase, 1967). Many prelingually deafened adults are illiterate (Moores, 1987).

Approximately 90-92% of deaf children are born into all hearing families and 96% of their parents are unable to communicate effectively with them (Mendelsohn, 1982), the deaf education issues discussed above are nationwide. The effects persist throughout the deaf child's entire life. In the community, their unemployment rate hovers around 75% (Conner, 1992 & Williams, 1972). Criminal behavior is attributed directly to hearing loss. Seventy-six percent of 179 correctional and rehabilitation personnel in federal and state programs agreed that effects of hearing disorders could lead to criminal behavior (Jensema & Friedman, 1988). Failure to develop effective communication can increase the likelihood of a deaf person having problems with the law and in being chronically unemployed.

Education of deaf children is not as it should be and that the results of deaf education "represent a failure of the system that is responsible for educating deaf children." (Johnson, Liddell, & Erting, 1989, p. 1). Evidence shows that academic achievement is affected by hearing loss. Studies indicate that the effects of sensory deprivation during the first year of life may be irreversible (Northern & Downs, 1974).

Unless appropriate educational and therapeutic measures are taken, the deaf child may achieve significantly below grade level. This gap tends to widen as the child goes through school. These problems have been directly related to low levels of language functioning and lack of support services, parental guidance, motivation and intelligence (Quigley, 1986).

Decades of standardized achievement testing suggest a severe educational gap between deaf and hearing students, especially in areas related to English, such as reading (Moores, 1987). There is no way that deaf children showing this gap can, even with the best of follow-up services, compensate for that from which they have been unnecessarily deprived (Harris, 1981).

So much in everyday life is communicated in written form that the ability to read is the key to the educational and social development of children. On the average, only 5% of deaf children in special schools or classes read at a 10th grade level or better at age

16 (Trybus & Karchmer, 1977). A much higher proportion, 60%, read at a level below sixth grade, and approximately 30% are functionally illiterate when they leave school. The most often quoted mean reading level for hearing-impaired persons 20 years or older is a 4.5 grade level (DiFrancesca, 1972). Even though these studies of reading achievement levels consistently show greatly depressed performance by deaf individuals, there is evidence that the performance might be even more depressed than those studies show (King & Quigley, 1985). Academic achievement results of a national testing program for hearing impaired students reported that the average reading growth was 0.2 grade levels per year of schooling (Sanders, 1988). Another study indicated that, on the average, a deaf child's progress in language development is one month per year (Gentile, 1971).

Programs which intervene early in the life of the child with a handicap or impairment can offset these negative effects of impairment. Even severely hearing-impaired children can function in regular classrooms if intervention is begun before the third year of life and in some cases success has been achieved with program initiation even after the third year (Simmons-Martin & Calvert, 1979).

At one time, there was a belief that the deaf child should start school at an older age than other children because the deaf child's language development was slower (Schein & Delk, 1974). However, delaying schooling will cause a massive language retardation (Grant, 1987 & Hart, 1978). Early detection of deafness is necessary so that a remediation program may be instituted while the central nervous system is still pliable and therefore responsive to change and before the child is subject to the shattering effects of repeated academic failure (Sheppard & Sheppard, 1982).

Most deaf children are either born deaf or lose their hearing before language and speech patterns have been established. Since they are denied many of the normal experiences in learning, it is all the more essential that they be given help for the best development as early in life as possible (Gregory, 1985; Ling, 1984; & Rubin, 1981).

As language patterns have not been established, deafness has been characterized as a disorder of communication. As communication is a learned behavior, there is a relationship between it and education (Schein & Delk, 1974). Successful education of deaf children ultimately depends on language acquisition (Davis & Silverman, 1978).

Due to this paucity of language, when a deaf child enters school, he or she is already well behind normal hearing children in such critical areas as language, knowledge about the world, and social skills This is due to the fact that over 90% of deaf children are born into all hearing families (Jensema & Trybus, 1978; Meadow-Orlans, 1980; & Rawlings, 1973).

Deaf children's needs are the same as those of hearing children. Meeting their needs is more difficult because of deafness and the accompanying language delay (Sanders, 1988 & White, Bush, & Casto, 1986). In spite of their pressing needs, in a typical school day, deaf children spend less time on academic subject matter than hearing children (Moores & Meadow-Orlans, 1990).

Thousands of research studies were synthesized by Walberg (1984) to identify the most important factors influencing education. It was found that one of the largest factors to improve achievement is home intervention to improve academic conditions in the home (Walberg, 1984). Studies show that even the best deaf children were retarded from 4 to 33 months in language development (Ewing, 1963). The profound language delay of deaf children has caused professionals to look at the area of early intervention. The idea of a critical period for language development also places great emphasis on early home intervention (Clark & Watkins, 1985).

Several writers (Gentile, 1971; Grant, 1987; Gregory, 1985; & Ling, 1984) stressed the importance of home early intervention with deaf infants because of this critical period for language development. These writers are in agreement that intervention should be begun before the age of two. Clark and Watkins (1985) concluded that intervention must begin as close to birth as possible.

The handicap of deafness inflicts profound language delay. This delay has not responded well to later remediation. Research shows a critical period for language development, starting at birth and concluding at age four. Intervention for deaf children, therefore, must begin as soon after birth as possible. It should be in the home (Clark & Watkins, 1985).

Influence of Early Experiences

A critical period exists for language development, i.e., from birth to five years of age (Gregory, 1985 & Ling, 1984). The first twelve months of a deaf baby's life is a period of crucial importance for the development of linguistic and communicative competence

(Grant, 1987 & Ling, 1984). Gregory (1985) stated that this time frame is important in the development of communication in deaf babies.

The acquisition of language is a time-locked function as the longer it is delayed, the less efficient the language will be. The deaf baby without intervention during the first two or three years of life will never reach his or her language potential (Chomsky, 1966; Lenneberg, 1967; & Northern & Downs, 1974).

Adding urgency to the effect of deprivation during this crucial period for language development, Ewing & Ewing (1971) reported on a comparison of the receptive and expressive language development of young deaf children with hearing children. This was indicated by the Watson-Pickles Scale by comparing the development of deaf children with normal hearing children as reflected on the Gessel Language Development Scale. The 10 highest functioning deaf children were delayed 5 to 33 months in receptive language development during the second to fifth years of life and from 4 to 27 months delayed in expressive language development during the same time period.

Most deaf children have hearing parents (Mendelsohn, 1982 & Gallaudet Demographic Studies, 1991). Deaf children are then born into hearing families who have little or no knowledge about deafness (Liben, 1978 & Mendelsohn, 1982). Their hearing parents are unable to communicate with them, as Florida School for the Deaf's Family Learning Experience in 1992 found that just 2% of hearing parents use sign language with their deaf children. Mendelsohn (1982) disclosed that just 4% are able to sign, while Murchison (personal communication, November 20, 1990) reported 2% doing so.

Families who are not able to communicate with their own deaf children have expectations that their deaf children will eventually acquire speech and lip-reading skills in school (Liben, 1978). These children face a delay in language acquisition as well as the mechanics of spoken language which permits a maximum of only a 25% comprehension in lip-reading. Many of these children understood as little as 5% when relying on lip-reading (Lowell, 1959).

The deaf baby's future academic performance may depend on the competency and mode of interaction (Blackwell, 1985) by his parents. The importance of working with the deaf child early to help him reach his full potential cannot be overemphasized. With early help, deaf children can often function at higher levels than has been dreamed possible in prior years (Hughes, 1988 & White, Bush, & Casto, 1986).

Intervention

Early intervention is the presentation of an amplification, audiology, communication and language curricula to the parents with the intent of the parents stimulating language development by using these intervention curricula with the deaf child (Michael & Paul, 1991). Approximately 28% of Florida's infants were found to be at risk for developmental delays (Center for Prevention and Early Intervention Policy, 1991). At the end of 1990, more than 600,000 children with special needs, birth through five years of age, were receiving intervention services (Hebbeler, Smith, & Black, 1991).

By the third year of life, an infant's brain nearly quadruples in weight with a corresponding increase in biochemical activity and synapse and dendrite growth. This is the best time of a person's life to overcome risk conditions. This is also the worst time to put off intervention. The reason for this is that the infant's brain is developing virtually all of its synapse and dendrite connections during this period. Early intervention during this time will assure the stimulation the brain needs to continue its development (Williams, 1983).

Researchers have conclusively shown that the child's experiences during the first three years are critical (Hess & Shipman, 1965; Levenstein, 1970; & Schaefer, 1979). Northern and Downs (1974) insisted that there is no way that follow-up services later in life can make up for a lack of early intervention. Deprivation during these critical years will impair development permanently (Center for Prevention and Early Intervention Policy, 1991 & Northern & Downs, 1974). Deprivation during the first three years of life can result in deaf adults who are unable to function beyond the concrete level of mental functioning. These deaf adults will not be able to handle abstract concepts (Sanders, 1988). A lack of intervention will therefore result in life-long harm at a great expense to society (McNulty, Smith & Soper, 1983) as custodial care for a single child can cost $100,000 per year. Without intervention, more deaf children will experience school failure, teen pregnancy, or commit crimes (Center for Prevention and Early Intervention Policy, 1991).

Within the first three years of life an infant's brain weight nearly quadruples with an increase in convolutions, biochemical activity, synapse and dendrite development (Williams, 1983). Except for the prenatal period, there is no other time in a human life that holds more potential for overcoming risk conditions or for lifelong harm from ignoring the young child's needs. Due to this rate of growth from birth to age three, the first three years of life is the only window of opportunity for these children. Early intervention must be done within this window of birth to age three for deaf children (Center for Prevention and Early Intervention Policy, 1991; Grant, 1987; & McAnnaly, Rose, & Quigley, 1987). Garwood, Fewell, and Neisworth (1988) stated that only one day of lost services in the life of a five-month-old deaf child is critical. However, 90% of those receiving intervention are inadequately served. This is happening when states scrutinize their budgets and cut programs they determine are not essential (Guralnick, 1991).

Early intervention with infants has a powerful influence on their development (Kagan, Kearsley, & Zelazo, 1980). Certain intellectual and emotional processes are particularly vulnerable to deficits during the early months. These include sensory perception, language development, the ability to establish deep and meaningful interpersonal relationships, creative and abstract thinking, and the ability to control impulse in the interest of long-range goals (Schlesinger, 1985).

Nine hundred eighty-five low birthweight children in well-baby services whose parents received training in intervention showed higher IQ (an average of 13.5 points higher) and fewer behavior problems at 3 years of age than low birthweight children who received only the well-baby services (Carlin, 1991). Positive effects can continue for several years as Skeels (1966) provided 35 infants developmental intervention. Their average IQ increased by 27.5 points and grade completion averaged twelfth grade. The children who did not receive this intervention had a 26 point IQ loss and averaged a third grade completion. All the intervention children were self supporting while many of the children in the control group were in institutions (Center for Prevention and Early Intervention Policy, 1991).

Early intervention programs can offset the negative effects of impairments (Northcott, 1979). Programs have shown that severely hearing-impaired children can function in regular classrooms if intervention is begun before the third year of life and in some cases success has been achieved with program initiation even after the third year.

Intervention programs which also train parents tend to maximize the probability of offsetting or remediating a child's impairments. In the main, the findings indicate that intervention programs which emphasize the training of parents to deal with their children and which stress the parents' cognitive development appear to have children who make greater gains. These data suggests that what a caregiver does during the early portion of a child's life does much to facilitate or hamper his or her development.

Many parents and professionals may be engaging early intervention techniques with the wrong ideas. There has been much talk in the media about how to create super-babies through early intervention. Parents of deaf children may think if they can accelerate the child's development, they will succeed in forever creating a more intelligent child. A faster rate of developing does not guarantee a higher level of academic achievement in later years (Korner, 1989).

Perhaps the success of early intervention is being measured using the wrong objectives such as higher academic achievement. Perhaps the focus of early intervention is to give the deaf child a broader and enriched development, to maintain development, and to facilitate future achievements (Korner, 1989). The aim of intervention should not only be to accelerate development but, rather, to maintain and facilitate it.

Center Based Intervention

Intervention can be home based or center based. In a center based curriculum model, the hearing impaired child is brought to a center where professionals work primarily with the child in language intervention. Often the center has a rigid communication model and the parents do not have the liberty of making a choice of what they feel is the most appropriate communication mode (Moores, Weiss & Goodwin, 1978).

Vernon and Koh (1970) compared children who had experienced three years of oral preschool (John Tracy Preschool Program). Groups were matched on age, IQ and number of subjects. Control groups were made up of children from oral and manual communication home environments. Participation in preschool did not seem to be the determining factor of later academic achievement advantages. However, the experimental preschool children scored significantly lower than the children without preschool experience from a manual communication home environment on the Stanford sub-test of paragraph meaning and reading.

Brill (1978) did a follow-up study using John Tracy Preschool Program graduates (N=264) at the California School for the Deaf at Riverside. The control group had no preschool programming. The Tracy graduates scored significantly higher on the Weschler Adult Intelligence Scale and on the total battery of the Stanford Achievement Test than the control group. An analysis of covariance showed that a statistically significant difference remained when the effects of IQ were controlled.

Moores, Weiss and Goodwin (1978) conducted a 6-year longitudinal study on preschool programs for deaf children. Subjects included children who had attended seven different preschools which emphasized different communication methodologies. The preschool children were found to have almost identical scores to hearing children in a control group on the Illinois Test of Psycholinguistic Abilities and the reading sub-test of the Metropolitan Achievement Test, Primer Battery. However, communication success as measured by the Receptive Communication Scale depended on the communication methodolgy of the preschool program in which the children had participated.

Moores, Weiss and Goldman (1978) indicated the best success was found with the speechreading and signing methodology. Here, communication between the deaf children and the staff is based on speaking and reading lips with simultaneous use of sign language. Sign language can be any form of manual communication adopted by the preschool program.

This is followed by the speech and fingerspelling methodolgy. Here, communication between the deaf children and the staff is based on reading lips with simultaneous use of fingerspelling. This is where words are spelled out on the fingers at the same time they are spoken.

Next to last is the speech and audition methodology. Communication between the deaf children and the staff is based on lipreading while reinforced by amplification.

Last in communication success is the auditory receptive communication methodogy. Here, the deaf child uses speech when communicating with others. When the staff communicates with the deaf child, their lips are hidden so the child must rely solely on amplification.

The 1969 Demographic Study of the Deaf, Office of Demographic Studies, Gallaudet College indicates that the average deaf child in the United States progresses less than two months per year in language and reading. Another Demographic Study showed a one month per year progress in language development (Gentile, 1971). Yet, some of the preschool children using the speechreading and signing communication methodology were found to have almost identical scores to hearing children.

Home Based Intervention

In the home based curricula, intervention occurs in the home setting, rather than a center, with parent and family involvement. Early home intervention can provide the psychological and emotional support that the parents need. Generally, home based early intervention programs are more comfortable for parents because many programs allow the parents to choose freely the communication option they feel best for their deaf child (N. R. Stavropulos, personal communication, June 3, 1992).

As a result of home demonstration programs, children displayed greater language competence and academic achievement compared to those whose parents were not involved in these programs (Epstein, 1987; Grant, 1987; & Hughes, 1988). Social researcher Urie Bronfenbrenner (1974), in a comprehensive review of early-learning programs, concluded that the most effective programs are those that involve the parent directly in activities with the child, and that the earlier such activities are begun and the longer they continue, the better. Students gained more in reading achievement if parents were involved by the teachers (Coleman, 1966 & Epstein, 1987). The greatest gains were reported in programs that included home visits, the education of parents, and a high degree of parental teaching activities (Colbert, 1977). The more interaction between the parents and the child, the better the development (Lewis & Rosenblum, 1978).

The parent-child relationships and activities during the earliest years have a great influence on the children involved (Bruner, 1975; Hughes, 1988; & Snow, 1972). As White and Watts (1973) stated, the mother is the "designer and consultant" who oversees the home world and creates the environment that can spark the child's vital natural curiosity during the one to three-year-old stage.

A 16-month project found that all children, regardless of family environment, seem to be quite similar during the first year of life (White & Watts, 1973). The parent-child relationship and activity during this period, however, have a great influence on the children involved. The project report also noted that, as much as the child needs an "enriching" environment, the parents need the know-how and information to provide that environment.

When parents have the information to provide early intervention, this home and parent influence will far outweigh school and teacher influence during a child's early learning years (Boulder Valley, 1975 & Moore, 1973). Children involved in early intervention programs showed significant gains in IQ and language development, and cognitive and achievement gains lasting into the elementary years--five to ten years after completion of the early childhood program (Colbert, 1977). Children who received teacher-designed home stimulation by their parents scored significantly higher on standardized tests and were able to maintain their gains longer than other children who attended only an in-school program. Teachers met with parents every two weeks (Boulder Valley, 1975).

Involving the parents in the care and planning for their infant allows them to enjoy satisfying feedback from their child. It is also at this early stage that the groundwork is laid for an effective alliance of parents and professionals concerning treatment (Grant, 1987 & Ling, 1984).

Harris (1966) found that parental participation in the preschool deaf child's total development has eliminated many of the differences that have set apart the deaf child from the hearing child. Progress has been accelerated. Many indications that early development, through parent education, will make higher education possible for many more deaf people.

Project DEBT (Developmental Education Birth through Two) was an early identification and intervention program which attempted to improve the quality of interaction among children who are handicapped and their parents. Statistically significant improvement was noticed in most except severely handicapped groups (Solomon, Wilson, & Galey, 1982).

Watkins (1984) did a comprehensive survey of infant hearing programs in the United States. From 26 responses to a questionnaire type survey, she had 96% indicating that a home visit program should be used for promoting language development.

Early Intervention With Deaf Children

Early intervention curricula are materials provided to parents in order to show them how to provide auditory and language stimulation for their child at home. These materials include curricula on amplification, audiology, communication, and language. The rationale of early intervention curricula is that the handicap of deafness imposes acute to profound language delay (Lee, 1985; Ling, 1984; Sanders, 1988; & White, Bush, & Casto, 1986). These disorders have not responded well to later education in K-12 programs. Brooks (1978) found the following:

> Despite dedicated and tireless efforts by educators of the deaf, early severe hearing loss persists as a promissory for reading failure. Not only do deaf students not progress in reading achievement according to grade level expectations, but the deficiency is cumulative (p. 87).

Language delay will result in the formal operational period, in which abstract thought processes emerge, being seriously delayed or never reached by deaf children. The deaf child who never attains the formal operations stage will not be able to handle abstract concepts later in life (Sanders, 1988). A major objective of early intervention is for hearing impaired children to achieve a high level of formal operations. To achieve this goal, efforts must be concentrated on the deaf child's sensorimotor period, which prepares the child for the next period, the pre-operational stage. This is when the important basic principles of learning in all domains are activated, and more importantly, language is acquired (Grant, 1987).

Early intervention for deaf children is necessary because their deafness is causing a massive language retardation (Grant, 1987 & Hart, 1978). The importance of early intervention for handicapped and at-risk children has been documented (Meisels, 1991, Michael & Paul, 1991; & Peterson, 1983). The quantity and quality of intervention needs to be greater than for those who can hear (Ingall, 1985). Linguistic input must be provided to deaf children at the earliest stages of development (Chomsky, 1966).

Deaf children starting school earliest tend to go furthest. Twenty percent who began school before five years of age completed one or more years of college compared with less than five percent of those who began school after six years of age (Schein & Delk, 1974).

Intervention is more effective if initiated during the newborn period when formative influences on the parent-infant relationship are believed to operate. This relationship-focused intervention differs in its attention to relationships and to the parents' own objectives and problem solving activities. Parents showed greater responsiveness to the infant such as more contiguous vocalizations and pleasure in contact. (Affleck, 1982 & Ling, 1984).

The Council of Executives of American Schools for the Deaf's survey suggested that the earliest possible intervention is good both psychologically and educationally for the deaf children and their parents (Craig, 1983). They felt that whenever possible, the diagnostic process should be completed and habilitation begun by the age of six months.

Early development was advocated as being important to later progress (Mercer, Algozzine, & Trifiletti, 1979). Families require early assistance to optimize positive adjustments in their disabled child.

Greenberg (1980) reported that for both oral and Total Communication children, earlier diagnosis and intervention were related to more advanced communication competency at age five. However, there appears to be no lasting effects for the oral deaf children. Vernon and Koh (1970) demonstrated that, by age nine, no differences were noticed between deaf children who had had oral preschool programs and those who had not had such training.

McNeill (1966) states:

> The fundamental problem to which we address ourselves in language acquisition by normal children is the simple fact that the process occurs in a surprisingly short period of time. Grammatical speech does not begin before 1.5 years of age; yet as far as we can tell, acquisition is virtually complete by 3.5 or 4 years. Thus a basis for the rich and intricate competency of adult grammar. . . must emerge in the short span of 24 to 30 months. (p. 120)

Lenneberg (1967) asserted "An individual may outgrow the capacity for the acquisition of language" (p. 1337). He termed this stage of development as behavioral resonance and defines it as the time when a child, after being exposed to the language of his social surroundings, suddenly responds to the stimuli and vocalizes in meaningful ways. The process is confined to the years just preceding the physical maturity of the brain when the nervous system is plastic and the cognitive processes are unfolding.

Streng (1967) believed that the capacity to acquire language may be transitory, and reach a peak around the ages two to four.

> If this is true, it leaves us in a rather hopeless situation unless language learning is seriously begun in the home before the age of two . . . the greater the delay in learning to communicate, the greater the delay in the more formal aspects of education and the more difficult is the task for both teacher and child. (p. 128)

The effects of sensory deprivation during the critical first year of life may well be irreversible (Rubin, 1981).

Meadow (1968) believed that if language is not developed during the early years of a child's life, little more than remedial work can be done since language will never develop spontaneously. Simmons (1967) stated that the capacity for language acquisition occurs only once in the early years of life.

The critical period for language development is thought to be from birth to about age five or six (McAnnaly, Rose, & Quigley, 1987; Rubin, 1981; & Simmon-Martin, 1983). This was echoed by June Grant (1987) as she considered the optimal time to initiate intervention to be during the first months of life. Undue delay in starting can hinder long-term development, for as Berlin (1984) pointed out, when children are not given language at an appropriate age, they are being shown that it is not important and are learning to do without it.

Positive Results

Empirical evidence shows the success of early intervention programs, such as SKI*HI, on the development of young deaf children (Clark, 1979; Covert, 1984; Watkins, 1984; & Watkins & Parlin, 1988). For example, the expressive and receptive language growth of SKI*HI children nationwide was determined in a recent study (1987). Using scores on the SKI*HI Language Development Scale, two pre/post test comparisons were made (Watkins & Parlin, 1988). The comparison between the Fall of 1986 and Spring of 1987 testings showed children increased their average receptive language performance by nearly thirteen months. Their expressive language improved by ten months for the same time period. The comparison of the Spring 1987 and Fall 1986 data showed language scores increasing by almost seven months receptively and six months expressively.

In a separate study, a comparison of the Spring 1991 and Fall 1990 data showed language scores increasing by a little more than seven months on the receptive and seven months on the expressive scale (SKI*HI, 1992). These are much larger improvements than the National Demographic Study (Gentile, 1971) which suggest only one month's language growth per year for children with a hearing impairment.

Colbert (1977) reported that children involved in early childhood family education programs showed significant gains in IQ and language development. The greatest gains, Colbert asserted, were reported in programs that included home visits, the education of parents, and a high degree of parental teaching activities.

A longitudinal study of the effects of the SKI*HI model was done (Watkins, 1984). The home-intervention children scored statistically and significantly higher than the no-home-intervention children on several outcome variables. Watkins reported that all educationally significant effect sizes favored the intervention children.

In another study by Daniel Ling (1984), it was shown that deaf students who typically show the greatest degree of success are those who are severely to profoundly hearing-impaired. These students had no additional handicaps and had an early start in total communication. Their parents had been involved with their children's education consistently from an early age, including use of total communication consistently and extensively at home. If the entire family uses total communication at home, the degree of success is heightened. Supporting this observation, Bronfenbrenner (1974) showed that the more involved the parents were in their child's education, the greater and longer-lasting were the child's gains.

Van Uden (1980) agreed by saying that a substantial majority of deaf children and families served by preschool and outreach personnel have found their way eventually into public school programs. The success record is unquestionably due to early intervention, amplification, parent education and parent support. Also, Watkins (1987), in her study on deaf children who are most at risk found that the increase in preschool and parent-education programs has resulted in an increasing number of deaf students with English skills that are similar to those of hearing children.

It was mentioned at the International Conference on Parents and Young Children (Northcott, 1979) that programs which intervene early in the life of the handicapped or impaired child can offset the negative effects of impairment. These programs have shown that severely hearing-impaired children can function in regular classrooms if intervention is begun before the third year of life, and in some cases success has been achieved with program initiation even after the third year.

Negative Results

Some researchers indicate that the gains of early intervention in general disappear after only two or three years. Looking at disadvantaged or children with disabilities in general, one study shows that the immediate benefits decline rapidly and have largely disappeared after 60 months. In this study (Casto & Mastropieri, 1986), the data suggests that the benefits are still apparent as long as two years later, but there are too few studies to draw definite conclusions.

In a study involving deaf children from six schools for the deaf, Phillips (1963) compared children receiving preschool training from age three on with others receiving no preschool training. By the time the children were nine years of age, no differences were found between experimental and control groups in terms of language arts, arithmetic, and socialization.

Using subjects from two schools for the deaf, Craig (1983) matched children who had preschool training (over age 3) with those who had no preschool training. No differences were reported in lipreading or reading skills.

McCroskey and Wheelos (1976) evaluated the effectiveness of a preschool home-centered program with an auditory emphasis by comparing children who had gone through the program with children who had received no training. The few differences found between the groups tended to favor the children who had received no preschool training. They postulated that perhaps the children who received early training had more severe problems and thus were identified at an earlier age. As they did not gather pretreatment data, this hypothesis must remain speculation.

Carol Musselman (1988) stated that early intervention was associated with higher receptive language scores in the first, but not in the final year. She remarked "... we must ask why early intervention continues to receive widespread support within the educational community" (p. 236).

Looking at the literature documenting little or no measurable long term improvement in deaf children, it is sometimes possible to conclude with considerable confidence that the desired effect was not obtained under the conditions in which the testing occurred. When the results are opposite to what was expected, there may be influential suppressor variables which might be obscuring a smaller true effect in the predicted direction. An illustration of how this may have an impact on this study is a quote from Arthur Schildroth (1986), "A more radical interpretation is that students who cannot achieve beyond a third- or fourth-grade reading level are the very students who stay in special education."

A Gallaudet Research Institute Working Paper 89-3 (1989) indicated that the results of deaf education is a failure. At the 1989 Deaf Way Conference, Paddy Ladd of England, the 1992 Chair of Deaf Studies at Gallaudet University, stated during his plenary presentation "As we all know, deaf education has been run by a bunch of criminals for the last 100 years" (Johnson, Liddell, & Erting, 1989). This may very well explain why some researchers find no lasting gains in achievement in deaf children.

The true effects of compensatory education programs have been obscured in much past research. Campbell and Boruch (1975) found that experimental groups receiving compensatory treatments came from economically poorer homes than did the more affluent control group children whose parents' incomes made them ineligible for the compensatory program. Since the children in experimental groups usually come from homes that are associated with lower achievement levels and slower growth rates over time, Campbell and Boruch argued that two opposing forces are set up in compensatory education experiments. First, there are differences in growth rates, which cause children in experimental groups to gain less than children in the control group over time. Second, there are true treatment effects which cause experimentals to gain more than would randomized controls. The net effect of these two forces can be the misleading appearance of either no treatment effect or even a harmful effect.

Using preliminary achievement test results to predict achievement levels several years later for deaf children may theoretically determine the effectiveness of virtually every early intervention program. When standardized achievement tests are used, later achievement results are highly correlated with initial tests (Badian, 1982; Butler, Marsh, Sheppard, & Sheppard, 1982; Fletcher & Satz, 1982).

In most validity studies, the longer the time interval between the collection of the predictor and criterion variables, the poorer the prediction. It is particularly interesting that reading scores grow more predictable with the passage of time. The best predictions of reading are more highly correlated with reading in the third grade (R = .60) than in first grade (R = .49) (Sheppard & Sheppard, 1982).

Badian (1982) found verbal-skills tests to be reliable in predicting reading scores on the Stanford Achievement Test (SAT) five years later. The Metropolitan Achievement Test was shown to have significant predictive validity seven years after the initial test during kindergarten (Fletcher & Satz, 1982). The predictive validity of the reading comprehension subtest of the SAT given to second and fourth graders correlated at the .73 level (Antonak, 1988).

The Center for Assessment and Demographic Studies at Gallaudet University has conducted a series of achievement studies focused on deaf students (Jensema, 1975; Jensema & Trybus, 1978; Trybus & Karchmer, 1977). Since the reliability coefficients of the SAT-HI Reading Comprehension subtest was estimated to be as high as .91, the achievement tests given to young deaf children should have a predictive validity correlation of around .73 (Antonak, 1988).

The items and subtest structure of the SAT-HI are identical to the regular SAT edition (Wolk & Allen, 1984).

The above data show that estimates can be made of the magnitude of effects of educational factors upon actual achievement growth of the deaf school population. A study by Wolk & Allen (1984) showed that the average deaf student progresses at approximately one-third the reading comprehension rate of the normal hearing students, when the assessment method is the SAT-HI. The data showed a leveling off in reading comprehension development in deaf children by the fifth grade. The study concluded with the anticipation that future research studies will employ further adaptations of standardized measures. This will give reliable estimates of growth and verify the effects of basic educational factors such as early home intervention on academic performance. Special education teachers are concerned whether achievement growth can be predicted for their students. These students have characteristics which may depress their achievement growth potential (Wolk & Allen, 1984).

Researchers have suggested that the severity of hearing losses has a significant effect on deaf children's reading achievement (Trybus & Karchmer, 1977; Jensema, 1975). Trybus and Karchmer (1977) published data that looked at deaf children's longitudinal achievement growth over three years. They reported that students with more profound hearing losses gained less than those with less than severe hearing losses; females gained more than did males; and deaf students with additional handicaps gained less than normal deaf children. However, they found no differences in reading-comprehension achievement gains for students with and without deaf parents.

Extensive data from the basic neurosciences and the applied behavioral sciences support the concept that organisms are maximally sensitive to the effects of the environment during early life. In the early intervention curricula, parents are shown that progress is measured in five major developmental spheres such as: (a) gross motor; (b) fine motor; (c) adaptive behavior; (d) personal-social behavior; and (e) speech and language. Parents seem confident and eager to concentrate efforts on the child's progress and can see beneficial effects (Sommers, McGregor, Lesh, & Reed, 1980).

Without early intervention, it is impossible, even with the best services, for any deaf children to compensate for that from which they have been unnecessarily deprived (Harris, 1981). Even if deaf children's behavior and developmental potential are neither fixed in early life by genetic factors nor, after a supposed sensitive period, are they impossible to change (Lerner, 1987 & MacDonald, 1985), most researchers find it extremely difficult to compensate for past deprivation.

The cost of trying to compensate for past deprivation is staggering. If Florida's 1989 cohort of infants and young children with developmental delays and conditions does not receive early intervention, over a quarter of a billion dollars will be spent by 2009 (Center for Prevention and Early Intervention Policy, 1991).

SKI*HI Intervention Model

The SKI*HI program is the only early intervention program for hearing-impaired children to be approved for national dissemination by the Joint Dissemination Review Panel of the U.S. Department of Education. The SKI*HI Model has been used with more than 8,000 children between 1977 and 1987 and is currently being used with more than 2,300 children in 140 sites throughout the country. The SKI*HI Program focuses on parents, who are taught how to provide auditory and language stimulation for the children in the home (Watkins, 1987).

Research shows the success of SKI*HI on the development of young deaf children (Clark, 1979; Watkins, 1984; & Watkins & Parlin, 1988). A longitudinal study of the effects of the SKI*HI model was done (Watkins, 1984). The home-intervention children scored statistically significantly higher than the no-home-intervention children on several outcome variables.

The expressive and receptive language growth of SKI*HI children nationwide was determined in a 1987 study. Using scores on the SKI*HI Language Development Scale, two pre/post test comparisons were made (Watkins & Parlin, 1988). The comparison between the Fall, 1986 and Spring, 1987 testings showed children increased their average receptive language performance by nearly thirteen months. Their expressive language improved by ten months for the same time period. The comparison of the Spring 1987 and Fall 1986 data showed language scores increasing by almost seven months receptively and six months expressively. A comparison of the Spring 1991 and Fall 1990 data showed an even larger increase (SKI*HI, 1992).

This researcher's review of literature did not find studies of long-term results of the application of SKI*HI curricula by anyone not involved with the SKI*HI program. A study on the long-term academic success of deaf children using SKI*HI early intervention curricula is needed to verify earlier research.

The literature review indicates that when language is deprived during the first three years of life, no amount of remedial education or therapy will compensate for the massive language retardation. When intervention is begun by the age of six months, the capacity for language acquisition in deaf children is virtually unlimited.

Chapter Three contains an explanation of the research procedures that were used during this investigation. Specifically, the next chapter describes the population, dependent and independent variables, procedures for data collection, data analysis instrument, subjects, treatment, setting, instrumentation, procedures, design, and data analysis.

CHAPTER THREE

METHODOLOGY OF THE STUDY

Chapter Three contains a description of the design of a study which could be significant in determining the relationship between the application of early intervention curricula and the academic achievement of deaf children. A demonstrated ability to predict future achievement levels immediately after completion of the early intervention curricula should assist in the implementation of future early intervention curricula. If early intervention for deaf children does result in improved academic achievement, every dollar invested in this program can return up to five times that amount because of lower costs in special education, public assistance, and criminal justice activities, as demonstrated by other early intervention programs (Committee for Economic Development, 1987).

This chapter contains the two research questions. The chapter also contains demographic information, the design of the study, description of the setting, subject description and selection, treatment of intervention children, instrumentation, procedures, and analysis procedures used to investigate the two research questions.

Research Questions

The purpose of this study was to investigate the effectiveness of early home intervention curricula in aiding and predicting future academic achievement levels of deaf children. Specifically, this study addressed the following two questions.

1. Will deaf children who participated in early home intervention curricula demonstrate different academic achievement at the beginning of regular schooling from children who had no home intervention curricula?

2. If differences in academic achievement were found, what was the direction of that difference and rate of change of that difference in the above two groups?

To investigate this issue, the researcher gathered data on deaf children at the Florida School for the Deaf and the Blind (FSDB) and used the Test of Early Reading Ability--Deaf or Hard of Hearing (TERA-D/HH) with selected deaf students. The study was designed to be a relationship study where use of a causal-comparative method of exploring relationships between variables allowed the researcher to look at the effect of the SKI*HI curricula on reading comprehension scores of deaf children.

Data to answer the research questions were obtained from the Test of Early Reading Ability--Deaf or Hard of Hearing (TERA-D/HH) instrument, published by PRO-ED (1991) and from a review of students' files at the FSDB. The TERA-D/HH Form A consists of 45 questions related to reading. The questions relate to children's ability to attribute meaning to printed symbols, their knowledge of the alphabet and its function, and their knowledge of the conventions of print. The questions were signed and spoken simultaneously to deaf or hard of hearing students. The students responded to questions ranging from identifying letters (What letter is this? Tell me its name.) to describing logos from a magazine (Tell me about these. What would you use them for?) and correcting stories (What is wrong with the way this is written?). The students' responses were transferred to a response record. This response record yielded two forms of standard scores: Normal Curve Equivalents (NCEs) and Quotients (RQ).

Normal Curve Equivalents are standard scores with a mean of 50 and a standard deviation of 21.06. Quotients are a transformation of the raw score into a standard scores that are based on a distribution having a mean of 100 and standard deviation of 15.

Reliability and validity for the TERA-D/HH have been established. The internal consistency was determined to yield a test-retest reliability of .87. The authors (Reid, Hresko, Hammill, & Wiltshire, 1991) state that the instrument's validity is supported by relationships between the TERA-D/HH and the Wechsler Intelligence Scale for Children-Revised and chronological age.

A file review to investigate the two research questions was done by the researcher. Out of 119 students in the Elementary Department, permission was granted by the principal and parents to review the files of 79 students. In the file review, these variables were obtained: age of child; age of mother at birth of child; race; degree of hearing loss; gender; intelligence quotient (IQ); and early intervention history.

Data analysis used to answer the two research questions included a report of the means and frequency distributions. A correlation coefficient of .85 or greater was considered the indication of a strong relationship in answering the research questions (Borg & Gall, 1983).

Threats to external validity in this study were minimal and results should be generalizable to deaf children in residential schools for the deaf similar in size and scope to the FSDB. Since the study included a test administered once, no threats to internal validity are posed by history, maturation, testing, instrumentation, statistical regression, or experimental mortality (Borg & Gall, 1983).

A threat to the internal validity of this study was the selection factor. This is true, however, of most studies that employ non-randomized samples. Matching of control and experimental children reduced these threats to some degree (Borg & Gall, 1983).

Design

This was a relationship study. Use of a causal-comparative method of exploring relationships between variables allowed the researcher to look at the effect of SKI*HI curricula on reading comprehension scores of deaf children. The causal-comparative method is an accepted technique used by researchers to explore causal relationships among variables that cannot be manipulated experimentally (Borg & Gall, 1983). Deaf children age 4 through 12 who had received SKI*HI intervention treatment earlier in their lives were compared to deaf children who had not received the treatment.

Since treatment was studied after it exerted its effects on the children at the FSDB, the design of this study is similar to the Campbell and Stanley (1963) ex post facto design. In this study, treatment was given as the application of the SKI*HI curricula.

This causal-comparative model facilitated the purpose of this study and is most realistic given the limits of the population available. The researcher's concern with determining whether differences between the treatment group and the control group reflects population differences resulted in the selection of the analysis of variance (ANOVA) as a test of significance. The ANOVA is considered by the researcher to be the most appropriate statistical procedure for the reading comprehension scores because it allowed the investigation of any differences between the early intervention and no-early intervention groups (McMillan & Schumacher, 1984).

The same variables were collected from the files of the children aged 4 to 12 without the early intervention treatment. The same instrument was used to obtain the dependent variable (TERA-D/HH Quotients) for both the control and experimental groups. Adherence to this described procedure was assured by the researcher doing all of the data collection and testing.

The *t*-test and the Pearson product-movement correlation coefficient was also used to analyze the differences between the experimental and control groups on the quotient scores. The *t*-test is the most common statistical procedure for determining the level of significance when two means are compared (McMillan & Schumacher, 1984).

The researcher used MYSTAT:Statistical Applications, Macintosh Edition for both the *t*-test and the Pearson product-movement correlation coefficient analyses. This program was run in a Macintosh PowerBook 165c computer.

Methodology

The purpose of this study was to investigate the effectiveness of early home intervention curricula in aiding and predicting future academic achievement levels of deaf children. A review of the literature revealed that there is a time window of optimum language acquisition and that the application of early intervention curricula resulted in immediate benefits. Only two long term studies were done and they contradicted each other. Therefore, this investigation was an attempt to advance this topic of research and to extend earlier findings to an older population of deaf students.

To obtain insight into achievement results of deaf students, deaf children from the FSDB age 4 through 12 were selected to determine the effects of early intervention curricula on achievement. The students in the control group were also from the FSDB.

At the FSDB, deaf children age 4 through 12 were given the TERA-D/HH test. Subject data were tabulated by the researcher and the Child Study Center staff in the categories of age of child, age of mother at birth of child, race, degree of hearing loss, gender, IQ, and early intervention history.

The methodology of this investigation is discussed according to setting, subject description and selection, and a description of the treatment procedure. Instrumentation, procedures, and data analysis are also presented.

Setting

The Florida School for the Deaf and the Blind in St. Augustine, Florida is the only state supported residential school for the deaf and the blind in the state. The School was identified as being involved in the SKI*HI program. This research was conducted in the School's deaf Elementary Department. The administration and parents expressed a willingness to permit testing of the students.

The School contains approximately 600 deaf and/or blind children age 4 through 21. These children come from every part of the state of Florida. Children whose residences are in Duval, Clay, Putnam, St. Johns, and Flagler counties are not residential students and are bused daily. Children with legal residences not in the above counties and at less than 200 miles from the School are sent home every Friday afternoon and return Sunday afternoon. Children whose residences are 200 or more miles away stay on campus for the entire week. Once a month, all children are sent home from at least three days up to two weeks at a time.

The Florida School for the Deaf and the Blind has three main academic departments. One is the Deaf Department and another is the Blind Department. The Special Needs Department contains children who are deaf and/or blind with additional exceptionality labels.

In the Deaf Department, there are three departments. These are the Elementary Department with pre-kindergarten through fifth grade; the Middle School Department consisting of students in grades 6 - 8; and the High School Department with students in grades 9 - 12. The Elementary Department contains children in the age range 4 - 12. This department was selected for the study.

Subject Description and Selection

The subjects consisted of deaf children age 4 through 12 enrolled in the deaf Elementary Department. All of the children in the deaf Elementary Department have deafness as the only primary handicap and have no other known exceptionality labels. Deaf children with additional exceptionality labels are in the School's Special Needs Department.

Students selected for the study met the criteria for being identified as deaf, and met the criteria and guidelines set forth by the state of Florida. Eleven of these met the criteria of having had the SKI*HI treatment, as determined by the Early Intervention Coordinator. These were children who completed the SKI*HI curriculum and attended the deaf Elementary Department.

An equal number of control group students were selected by matching these students with the variables of the experimental group. Variables for each group were listed in a data base and sorted into dichotomous groupings or by numerical order to ensure close matches. These groups shared the same characteristics such as degree of hearing losses, age, race, gender, and intelligence.

To obtain the subjects for this study, written permission was requested and received from the Principal of the Deaf Department (Appendix A) and verbal permission from the Supervising Teacher of the deaf Elementary Department and the Deaf Department's Director of Student Life.

Parents' names and addresses were obtained for all of the 119 students in the deaf Elementary Department. Letters were mailed to these parents, asking for permission to test their children (Appendix B). They were asked to sign the letters and to return them in the enclosed stamped and addressed envelopes. No follow-up letters or telephone calls were made. Although no minimal response rate was established in the proposal for the study, the final response rate of 66.4% was deemed acceptable by the researcher. Once letters were signed and returned, students' records were examined to ascertain whether the students met the criteria for subject selection. Information regarding the application of the SKI*HI curricula were obtained from the Early Intervention Coordinator. Information regarding the students' birthdays, age of mothers at birth of students, race, degree of hearing loss, gender, and IQ were obtained from individual student folders located in the Child Study Department.

Eleven students were identified as having had the early intervention treatment. These potential experimental group students were matched with control group students on the basis of age, race, gender, and IQ. No close matches were found for two experimental group students. One experimental group student was no longer attending the deaf Elementary Department by the time the Test of Early Reading Ability--Deaf or Hard of Hearing (TERA-D/HH) test was given. This left a total of 8 students in the experimental group.

Adding the matched control group students, a total of 16 students were selected for this study.

Treatment of Intervention Children

Infants who were identified by hospitals as being in a high risk category for being deaf were tested for hearing losses by designated hospitals in the State of Florida. Local education agencies were notified by these hospitals regarding the births of these hearing impaired infants. The local education agencies contacted the parents and offered assistance. The parents of the experimental group subjects met individually with parent trainers from the Sensory Impaired Home Intervention (SKI*HI) program. The meetings took place in the homes of the subjects.

The parents agreed to use an amplification, audiology, communication, and language curricula with their deaf children on a continuous basis. The SKI*HI trainer met with the parents for at least one hour every week for one year. The trainer showed the parents how to use amplification and audiology in order to enhance communicating with their deaf children. Parents either purchased or were loaned hearing aids to provide the amplification stimulation.

Communication options, including sign language and speech, were explained to the parents and they were free to choose a communication method. The SKI*HI trainer provided the parents with pamphlets and videotapes and demonstrated to the parents how to apply the communication and language curricula on a continuous basis when interacting with their deaf children.

At the end of the year-long training session, the parents were able to maintain the communication and language curricula while utilizing the amplification device to enhance communication. The subjects were then enrolled in the FSDB.

Instrumentation

One published instrument was used in the study: the Test of Early Reading Ability--Deaf or Hard of Hearing (TERA-D/HH). This test is the only individually administered test of reading designed for students with sensory hearing loss. It is also the only test normed on deaf and hard of hearing children younger than 8 years old. It was normed with a national sample of hearing-impaired students. The sample was designed to be representative on several key demographic variables (e.g., sex, race, degree of hearing loss, age of onset of hearing loss) calculated by the Center for Assessment and Demographic Studies, Gallaudet University (Reid, Hresko, Hammill, & Wiltshire, 1991). In that norming, the TERA-D/HH was administered to 1,146 hearing-impaired students. These students were selected from the data base developed by the Center for Assessment and Demographic Studies through its Annual Survey of Hearing-Impaired Children and Youth, a data base containing demographic and educational information on more than 50,000 hearing-impaired students. The Examiner's Manual and Record Form were obtained from PRO-ED, 8700 Shoal Creek Boulevard, Austin, Texas 78758.

The TERA-D/HH consists of 44 or 45 questions, depending on the form used. Depending on the age of the deaf child, test items are presented at different levels. For example, if the deaf child is 3 - 4 years old, the child is presented with question number one. If the child is 5 - 6 years old, the child is presented with question number 10. Children 7 years or older begin with question number 25.

TERA-D/HH counts all scores below the starting question as accurate. For this reason, possible raw scores range from zero to forty-four or forty-five. The possible quotient scores range from 50 to 150. The dependent variable in this study was the quotient score of the TERA-D/HH.

The study included the early reading ability quotient score of the TERA-D/HH. Early reading performance's relationship to later reading is clear and direct (Hall, 1987). Reading comprehension was cited as being a valid, reliable measure of academic achievement. Sheppard and Sheppard (1982) correlated reading comprehension to academic achievement.

After permission to conduct the study was obtained, the researcher used the instrument. Form A of TERA-D/HH was administered to sixteen students enrolled in the deaf Elementary Department of the FSDB.

Responses to the questions were entered into the Form A record form. The questions referred directly to the student's ability to construct meaning from print, knowing the alphabet and its functions, and print conventions.

Construction of meaning from print include print awareness in figural and situational contexts, relational vocabulary, and disclosure. Knowledge of the alphabet has two elements: letter naming and alphabet recitation and oral or signed reading. Print conventions are behaviors such as page turning, book orientation, reading print from left to right and from top to bottom, line by line. Other conventions include proof-reading, which is a late-developing skill depending on considerable knowledge and exposure (Reid, Hresko, Hammill & Wiltshire, 1991).

The results allow students to be identified who are significantly different from their peers in the early development of reading. Another purpose of the TERA-D/HH instrument is to document a student's progress in reading.

Procedures

The research was a study of the relationship between the long term academic achievement scores of deaf children and the application of an early intervention curricula. Participants in the study were deaf children in the Elementary Department at the FSDB between the age of 4 and 12 who had the early intervention curricula applied and an equal number of deaf children with matching variables in the control group.

Selected students were tested with the TERA-D/HH instrument and their files reviewed. The researcher looked for relationships between each of the seven variables (age of child, age of mother at birth of child, race, degree of hearing loss, gender, IQ, and early intervention history) and the TERA-D/HH scores. The students' identities have been kept confidential.

Access to the student files at the Child Study Center was granted to the researcher by the FSDB's Deaf Department Principal (Appendix A). Permission (Appendix B) to administer the TERA-

D/HH instrument was obtained from students' parents. Parents' name and addresses were obtained from the students' files.

The 16 students selected were given Form A of the TERA-D/HH within a two-week period at the beginning of the 1993-94 School Year. The researcher administered the test as the examiner must be proficient in the use of communication methods that are most comfortable and appropriate for the students being tested. These include American Sign Language, Signed English, total communication and fingerspelling. The researcher was evaluated by the FSDB as being proficient in these communication methods.

Chapter 2 of the Examiner's Manual of TERA-D/HH gave the administration and scoring procedures to be followed. The researcher established rapport with the subjects by asking general information, giving the subjects time to relax and become familiar with the surrounding environment. This rapport setting period also allowed the researcher an opportunity to determine the best communication method during the actual testing session. Some subjects were more comfortable with Signed English while others preferred American Sign Language or total communication and fingerspelling. The subject's preferred communication method was used during the testing session.

A separate record form (Form A) was used for each student. This form allowed the examiner to record identifying information for each student, including degree of hearing loss, name, gender, and age. The record form allowed the examiner to see the test items, correct responses, and provided a scoring area. This permitted the examiner to immediately use the examiner's manual to determine the normal curve equivalents and quotient scores.

Seventy-five percent of tests were given in a room without visual distractions in the subjects' dormitories immediately after classes. As four subjects were scheduled to be bused home immediately after school, twenty-five percent of the testing was done in a quiet corner of a classroom during the school day.

Analysis

The researcher considered the relationship between each of the seven variables as found in the students' files and the quotient scores of the TERA-D/HH instrument. The purpose was to determine the relationship between these variables and the quotient scores.

The researcher employed descriptive statistics and nonparametric statistical analysis to analyze the data. Means and frequency distributions were used to describe the independent variables. One-way analysis of variance tests and *t*-tests were used to determine relationships between each of the independent variables and the quotient score of the TERA-D/HH.

The dependent and independent variables were collected on all children from age 4 to 12 who completed the SKI*HI curricula. Each student file in the Child Study Center included the following information: age of child, age of mother at birth of child, race, degree of hearing loss, gender, IQ, and early intervention history.

The School's Early Intervention Coordinator provided a list of students who had the SKI*HI treatment. This list was used to gather the initial files in order to obtain the variables.

The same variables were collected from the files of the children aged 4 to 12 without the early intervention treatment. The same instrument was used to obtain the dependent variable (TERA-D/HH Quotients) for both the control and experimental groups. Adherence to this described procedure was assured by the researcher doing all of the data collection and testing.

The dependent variable was subjected to a multiple regression analysis with age, age of mother at birth of child, gender, race, degree of hearing loss, IQ and history of intervention as independent variables. A forced entry model was used, with the independent variables entered one at a time in the order listed.

Information from the students' files and tests were entered into a table (Appendix C). Data were analyzed on the MYSTAT:Statistical Applications, Macintosh Edition program in a Macintosh PowerBook 165c computer.

Background Information

Deaf students age four through twelve were tested. The test was used to find the quotient scores of the TERA-D/HH. Before a sample could be selected, the files of 79 students were reviewed. The review was used to gather data about the participants in the study using seven variables: gender, race, degree of hearing loss, early intervention history, age of child, age of mother at birth of child, and intelligence scores.

The majority of the students in the Elementary Department were Caucasian students. The information gathered from the files indicated that 81.25% of the subjects were Caucasian. The control group consisted of 75% Caucasian subjects and 25% African-American subjects. The treatment group consisted of 87.5% Caucasian subjects and 12.5% African-American subjects. The ethnic data are presented in Table 1.

Table 1

Analysis of the Independent Variable Race of the Deaf Students Studied (N = 16)

Race	N	Percentage
Caucasian	13	81.25
Control group	6	37.50
Treatment group	7	43.75
African-American	3	18.75
Control group	2	12.50
Treatment group	1	6.25

Thirteen students were identified as having their hearing tested with reliable results. The majority of these subjects, 69.2%, had profound hearing losses. The data indicate that 9 subjects (69.2%) had profound hearing losses, 3 subjects (23.1%) had severe hearing losses and 1 (7.7%) had a moderate hearing loss. Four (30.8%) control subjects and five (38.5%) treatment subjects had profound hearing losses. One control subject (7.7%) and two treatment subjects (15.4%) had severe hearing losses. The only subject with a moderate hearing loss was in the treatment group. The hearing loss data are presented in Table 2.

Table 2

Analysis of the Degree of Hearing Loss of the Deaf Students Studied (N = 13)

Degree	N	Percentage
Moderate	1	7.7
Control group	0	0
Treatment group	1	7.7
Severe	3	23.1
Control group	1	7.7
Treatment group	2	15.4
Profound	9	69.2
Control group	4	30.8
Treatment group	5	38.5

The file review showed 11 students had the SKI*HI treatment. One student transferred to another school before testing was begun and two were not examined because of a lack of close matches to the control group in age, gender, and race. This left the researcher with eight subjects with the intervention treatment. Table 3 contains early intervention history data for the deaf students tested.

Table 3

Analysis of the Early Intervention History of the Deaf Students Studied (N = 16)

Early Intervention	N	Percentage
Yes	8	50.00
No	8	50.00

More than one-half of the population (58.7%) of the FSDB was composed of males. Eleven females (68.75%) and five males (31.25%) made up the sample.

The control group had 2 males (25%) and 6 females (75%). The treatment group had 3 males (37.5%) and 5 females (62.5%). Table 4 contains the gender data of the deaf students tested.

Table 4

Analysis of the Gender of the Deaf Students Studied (N = 16)

Gender	N	Percentage
All		
Males	5	31.25
Females	11	68.75
Control Subjects		
Males	2	12.50
Females	6	37.50
Treatment Subjects		
Males	3	18.75
Females	5	31.25

With regard to age, all of the subjects were between 4 years, 3 months (4-3) to 12 years, 9 months (12-9) of age. The range of ages was 8 years, 6 months (8-6). The mean of the ages was 7 years, 3 months (7-3) with a standard deviation of 2 years, 11 months (2-11).

The control subjects were between 4 years, 3 months (4-3) to 12 years, 4 months (12-4) of age. The range of ages was 8 years, 1 month (8-1). The mean of the ages was 7 years, 1 month (7-1). The standard deviation of the ages was 3 years, 0 month (3-0).

The treatment subjects were between 4 years, 3 months (4-3) to 12 years, 9 months (12-9) of age. The range of ages was 8 years, 6 months (8-6). The mean of the ages was 7 years, 6 months (7-6). The standard deviation of the ages was 3 years 0 month (3-0).

The majority of the subjects (56.3%) were under seven years of age. Table 5 contains the range, mean, and standard deviation of the subjects' ages.

Table 5

Analysis of the Range, Mean and Standard Deviation of the Ages of the Deaf Students Studied (N = 16)

	Range	Mean	Standard Deviation
All Subjects	8-6	7-3	2-11
Control Group	8-1	7-1	3-0
Treatment Group	8-6	7-6	3-0

The age of the mothers at birth of the subjects were between 21 and 42 years of age. The information gathered from the student files indicated most of the mothers (62.5%) were over 33 years old when the subjects were born. The range of ages was 21 years. The mean of the ages was 32.3 years. The standard deviation of the ages was 6.3 years.

The control subjects' mothers range of ages was 21 years. The mean of the ages was 31.7 years. The standard deviation of the ages was 7.2 years.

The treatment subjects' mothers range of ages was 17 years. The mean of the ages was 32.8 years. The standard deviation of the ages was 5.6 years. Table 6 contains the range, mean, and standard deviation of the mothers' ages.

Table 6

Analysis of the Range, Mean and Standard Deviation of the Ages of the Deaf Students' Mothers (N = 16)

	Range	Mean	Standard Deviation
All mothers	21	32.3	6.3
Control subjects' mothers	21	31.7	7.2
Treatment subjects' mothers	17	32.8	5.6

Of the 16 subjects tested, 5 subjects were either too young for a standardized intelligence test or no scores were posted in their folders. Of 11 subjects, IQ scores ranged from 62 to 127. The range of scores was 65. The mean score was 98.18. The standard deviation was 21.17.

Of the 4 control subjects, IQ scores ranged from 65 to 127. The range of scores was 62. The mean score was 97.5. The standard deviation was 26.91.

Of the 7 treatment subjects, IQ scores ranged from 62 to 126. The range of scores was 64. The mean score was 98.57. The standard deviation was 19.61. Table 7 contains the range, mean, and standard deviation of the subjects' IQ scores.

Table 7

Analysis of the Range, Mean and Standard Deviation of the IQ Scores of the Deaf Students Studied (N = 11)

	Range	Mean	Standard Deviation
All subjects	65	98.18	21.17
Control group	62	97.50	26.91
Treatment group	64	98.57	19.61

From the data, the profile of the average student studied can be described. The profile is of a white female with a profound hearing loss, 7 years and 4 months of age whose mother was 32 years and four months at the time of the child's birth. The child has an IQ score of 98.18.

Summary

Chapter Three contained a delineation of the design of a study to determine the relationship between the long term academic achievement scores of deaf children and the application of an early intervention curricula. The data sought in this study were to have provided information regarding ways to improve the academic achievement of deaf children.

The chapter contained demographic information, the design of the study, description of the setting, subject description and selection, treatment of intervention children, instrumentation, procedures, and analysis procedures which were used to investigate the following two research questions.

1. Will deaf children who participated in early home intervention curricula demonstrate different academic achievement at the beginning of regular schooling from children who had no home intervention curricula?

2. If differences in academic achievement were found, what was the direction of that difference and rate of change of that difference in the above two groups?

The students in both the experimental and control groups were students in the deaf Elementary Department at the FSDB. Data were collected by file review and the Test of Early Reading Ability--Deaf or Hard of Hearing (TERA-D/HH). Descriptive statistics and nonparametric statistical analysis were used to analyze the data.

Chapter Four contains results and conclusions for the research questions. An overall conclusion related to the purpose of study is also given. This chapter contains implications for the students, their parents, and the FSDB. Recommendations for future studies and a summary conclude the chapter.

CHAPTER FOUR

RESULTS

Introduction

The purpose of this study was to investigate the effectiveness of early home intervention curricula in aiding and predicting future academic achievement levels of deaf children. To investigate how the independent variables of gender, race, degree of hearing loss, early intervention history, age of child, age of mother at birth of child, and intelligence scores were associated with reading comprehension scores of deaf children, the researcher developed two research questions, selected a measurement instrument, collected data from the student files, and tested students at the Florida School for the Deaf and the Blind (FSDB). Specifically, this study addressed the following two questions.

1. Will deaf children who participated in early home intervention curricula demonstrate different academic achievement at the beginning of regular schooling from children who had no home intervention curricula?

2. If differences in academic achievement were found, what was the direction of that difference and rate of change of that difference in the above two groups?

To answer the research questions, data were collected from the student files at the FSDB. Data collected consisted of seven variables:

gender, race, degree of hearing loss, early intervention history, age of child, age of mother at birth of child, and intelligence scores. The files of 79 students were reviewed and data collected from twenty-two students.

Deaf children's reading comprehension were tested. The testing instrument was the Test of Early Reading Ability--Deaf or Hard of Hearing (TERA-D/HH). Sixteen students were tested.

This chapter includes information about the students; quotient scores from TERA-D/HH; and an analysis of the data. The two research questions will then be answered and discussed on the basis of the findings of the study.

Findings

The instrument used in this study to measure reading comprehension was the Test of Early Reading Ability--Deaf or Hard of Hearing (TERA-D/HH). The quotient scores were used as the dependent variable. The purpose of the TERA-D/HH is to obtain a measurement of each student's reading comprehension level.

Table 8 shows the findings for the influence of the application of an early intervention curricula on the quotient scores of TERA-D/HH. A *t*-test analysis of the dependent variable TERA-D/HH quotients is shown. The direction of change favors the subjects that had the SKI*HI early intervention curricula applied before the beginning of regular schooling. The dependent *t*-test significance was 0.0449 and the mean quotient of the SKI*HI subjects was 54.5 with a standard deviation of 23.11 compared with the mean quotient of the control subjects of 42.13 with a standard deviation of 25.51.

The difference in quotients has the SKI*HI subjects 12.37 points higher than the subjects without early intervention history. The independent variable, application of early intervention curricula, met the .05 level of significance established in the study.

Table 8

Dependent *t*-test of the Independent Variable TERA-D/HH Quotient Scores of the Deaf Students Studied (N = 16)

Subjects	Mean	Standard Deviation	Differences in means	*t* value	one-tailed significance
Early Intervention	54.50	23.11			
No Intervention	42.13	25.51			
			-12.37	-2.01	0.0449

Results

To examine the relationship between the application of an early intervention curricula and the academic achievement of deaf children, the following two research questions were developed.

1. Will deaf children who participated in early home intervention curricula demonstrate different academic achievement at the beginning of regular schooling from children who had no home intervention curricula?

2. If differences in academic achievement were found, what was the direction of that difference and rate of change of that difference in the above two groups?

Data from file reviews and from the TERA-D/HH were entered into a table (Appendix C). Data were analyzed on a Macintosh

PowerBook 165c using MYSTAT:Statistical Applications, Macintosh Edition. Data analysis was effected with assistance from faculty members in the Department of Education Leadership of the University of Florida.

Research Question 1

The first research question sought to examine the relationship between early home intervention curricula application and academic achievement of deaf children at the beginning of regular schooling. The answer to the research question required an analysis of the data from the Test of Early Reading Ability--Deaf or Hard of Hearing (TERA-D/HH) and the file reviews. The data analysis procedure used for this project was the Pearson product-moment correlation coefficient. It was used to determine relationships between the early intervention history data collected in the file reviews and the quotient scores of the TERA-D/HH.

For the purpose of this study, a correlation coefficient of .85 or greater was considered an indication of a strong relationship. “Prediction studies in education very rarely yield correlations this high. When obtained at this level, however, correlations are very useful for either individual or group prediction” (p. 624). Coefficients less than .85 but greater than .65 were considered meaningful relationships. Coefficients less than .65 but greater than .35 were considered less meaningful relationships (Borg & Gall, 1983).

Testing with the Pearson product-movement correlation coefficient indicated a correlation coefficient of 0.917 in the relationship between the influence of the application of the SKI*HI curricula and the academic achievement as indicated by the TERA-

D/HH quotient scores of deaf children age 4 - 6 at the beginning of regular schooling (Table 9). The correlation coefficient was considered meaningful.

Table 9

Correlation Coefficient of the Influence of the SKI*HI Curricula and the TERA-D/HH Quotient Scores of Deaf Children Age 4-6 at the Beginning of Regular Schooling (N=9)

	TERA-D/HH Quotient	Significance
SKI*HI	0.917	>0.0449

Finding #1

The study indicated a strong correlation between the application of an early intervention curricula (SKI*HI) and the academic achievement of deaf children at the beginning of regular schooling.

Research Question 2

The purpose of the second research question was to examine if differences were found, and if so, what was the direction and rate of change in the academic achievement of children who participated in early home intervention and children who did not have early home intervention. To answer the question required an analysis of the data from the Test of Early Reading Ability--Deaf or Hard of Hearing (TERA-D/HH) and the file reviews.

Table 10 presents a *t*-test analysis of the dependent variable TERA-D/HH quotients. The direction of change favors the subjects that had the SKI*HI early intervention curricula applied before the beginning of regular schooling. The dependent *t*-test significance was 0.0449 and the mean quotient of the SKI*HI subjects was 54.50 with a standard deviation of 23.11 as compared with the mean quotient of the control group subjects of 42.13 with a standard deviation of 25.51. The difference in quotients has the SKI*HI subjects 12.37 points higher than the subjects without early intervention history. The independent variable, application of early intervention curricula, met the .05 level of significance established in the study.

Table 10

Dependent *t*-test of the Independent Variable TERA-D/HH Quotient Scores of the Deaf Students Studied (N = 16)

Subjects	Mean	Standard Deviation	Differences in means	*t* value	one-tailed significance
Early Intervention	54.50	23.11	-12.37	-2.01	0.0449
No Intervention	42.13	25.51			

Finding #2

The study indicated a strong positive correlation between early intervention and academic achievement. The students with the early intervention treatment increased in academic achievement at at .05 statistically significant level.

Summary

This chapter has presented the results of a study of the relationship between the application of early intervention curricula and the academic success of deaf children as measured by reading comprehension. The findings included descriptive statistics pertaining to the Test of Early Reading Ability--Deaf or Hard of Hearing (TERA-D/HH) and answers to the study's two research questions.

The two research questions that were developed to investigate the relationship between the application of early intervention curricula and the academic success of deaf children were answered based on the findings. In answer to Research Question 1, the findings indicated a strong correlation between the application of an early intervention curricula (SKI*HI) and the academic achievement of deaf children at the beginning of regular schooling.

In answer to Research Question 2, the findings indicated a strong positive correlation between early intervention and academic achievement. The students with the early intervention treatment increased in academic achievement.

Chapter Five contains a discussion of these findings. Implications of these findings are discussed as they pertain to the students, parents, and the FSDB. Recommendations for further research are given.

CHAPTER FIVE

CONCLUSION, IMPLICATIONS AND RECOMMENDATIONS

Summary

This chapter contains the conclusions, implications, and recommendations that resulted from a study of the relationship between the long term academic achievement scores of deaf children and the application of an early intervention curricula. The purpose of this study was to investigate the effectiveness of early home intervention curricula in aiding and predicting future academic achievement levels of deaf children. It has been stated in the literature that deaf children are significantly behind hearing children in reading comprehension and this deficit worsens every year of regular schooling until most are functionally illiterate. The two longitudinal studies on the long-term effects of home-based intervention on deaf children reached contradicting conclusions.

The researcher designed this research project to determine whether the application of an early intervention curricula would significantly increase reading comprehension and to determine if the difference would still exist years after completing the early intervention curricula.

Specifically, answers were sought for the following questions.

1. Will deaf children who participated in early home intervention curricula demonstrate different academic achievement at the beginning of regular schooling from children who had no home intervention curricula?
2. If differences in academic achievement were found, what was the direction of that difference and rate of change of that difference in the above two groups?

Conclusion

This study was designed to examine the relationship between the long term academic achievement scores of deaf children and the application of an early intervention curricula. Research Question 1 examined the issue of whether deaf children who participated in early home intervention curricula would demonstrate different academic achievement at the beginning of regular schooling from children who had no home intervention curricula. Research Question 2 addressed the issue of the direction and rate of change between children in the experimental group and the control group.

Result of Research Question 1

The study indicated a strong correlation between the application of an early intervention curricula (SKI*HI) and the academic achievement of deaf children at the beginning of regular schooling.

Testing with the Pearson product-movement correlation coefficient indicated a correlation coefficient of 0.917. The correlation coefficient was considered meaningful.

Conclusion

Children who experienced early home intervention scored higher than children who had no home intervention curricula.

Result of Research Question 2

The result indicated a significant difference between the academic achievement of the children in the experimental group as compared with the children in the control group. The differences in means favored the children who had the early intervention curricula application. The preschool children in the experimental group had a mean TERA-D/HH quotient score 6.50 points higher than the preschool children in the control group.

The entire early intervention group had a mean TERA-D/HH quotient subscore of 54.50. The entire control group had a mean subscore of 42.13. The difference in means was 12.37 points favoring the early intervention group.

Conclusion

The study indicated a strong positive correlation between early intervention and academic achievement. The students with the early intervention treatment increased in academic achievement.

Discussion

The results of this study are discussed in relation to the correlation between the application of an early home intervention curricula and the academic achievement of deaf children. In this study, children who experienced early home intervention scored higher than children who had no home intervention curricula.

The Pearson product-movement correlation coefficient of 0.917 between early intervention and academic achievement indicated a strong relationship according to Borg and Gall (1983). The students with the early intervention treatment increased in academic achievement at a .05 statistically significant level.

Implications

An implication of these findings is that deaf students in residential schools have needs that should be addressed by the application of an early intervention program such as the SKI*HI curricula. Identifying infants as deaf and administering the SKI*HI curricula has the potential to enhance academic achievement. Since deaf students show lower levels of reading achievement than hearing students, this group is at higher risk for illiteracy and unemployment after leaving school. Recognizing this implication should have an ensuing effect on state policy that would provide early intervention to every deaf infant. This is especially significant for deaf children, who may be more disadvantaged if a total inclusion policy is adopted by school districts, leaving the children with less support services. Being able to read to learn may be their key to survival in the schools of the 21st Century. The outcome may help meet the objective of the national education goals which stated that by the year 2000, every adult American will be literate and possess the knowledge necessary to compete in a global economy (National Goals for Education, White House, 1990).

Another implication is that parents now have readily accessible tools to equip their deaf infants with the ability to read, which is one of the best predictors of future success. Reading comprehension was cited as being a valid, reliable measure of academic achievement. Sheppard and Sheppard (1982) correlated reading comprehension to academic achievement. The SKI*HI curricula was especially designed for parents to interact with their children on a continuous basis, using language, communication, audiology, and amplification.

Another implication of this study is that schools now have an effective curricula to help deaf children do better academically. This curricula will also involve parents in the educational process. Residential schools can utilize this early intervention curricula to exert a positive influence on the education of deaf children. Increased funding and implementation of early intervention by schools may be viewed as a significant contribution to the future success of deaf people in the 21st Century.

Recommendations for Further Studies

There is an absence of information or data as to the grade point average of the present population of early intervention students. This lack of information needs to be addressed further to enhance legislative and school board decisions concerning funding and implementation of early intervention programs.

Research needs to be done on the retention rate of deaf students. Additional studies are needed to examine the retention rates of the early intervention population and students without the early intervention treatment.

The SKI*HI program is a relatively recent curricula developed for use with deaf infants. Therefore, it is too early to study the influence of early home intervention on the graduation rate of deaf children in high schools and colleges. It is certainly recommended that a study be made related to deaf students receiving regular diplomas in high schools and degrees in postgraduate institutions.

Additional studies are needed to determine if the results would differ if the profiles were based upon a larger and more varied student population. With the increase in parent advisors and deaf infants in the SKI*HI program, additional studies are needed to test the validity of the findings in light of this larger and more varied student population. In the meanwhile, it is recommended that the TERA-D/HH instrument be administered yearly as a regular test to follow the present cohort and to track new students.

Summary

The results of this study of the relationship between the long term academic achievement scores of deaf children and the application of an early intervention curricula generated conclusions, implications, and recommendations based on two research questions. The major conclusion based on Research Question 1 was that children who experienced early home intervention scored significantly higher than children who had no home intervention curricula. From this conclusion it may be inferred that the application of an early intervention curricula is a crucial step in ensuring academic success of deaf children. It is recommended that the effects of early intervention on other measures of academic performance such as grade point average and reading comprehension scores be researched.

The major conclusion based on Research Question 2 was that a strong positive correlation existed between early intervention and academic achievement. Students with the early intervention treatment increased in academic achievement. The implication drawn from this conclusion was that early intervention has a significant positive influence on the academic achievement of deaf children. As stated previously, the recommendations of this study were that this implication be reexamined and that research be designed to determine the effects of early intervention on other measures of academic performance such as grade point average.

This chapter contained the conclusions, implications, and recommendations that resulted from a study of the relationship between the long term academic achievement scores of deaf children and the application of an early intervention curricula. The results of this study underscored the need for continued research in the area of early intervention and its influence on academic achievement of deaf children.

APPENDIX A

PERMISSION FROM PRINCIPAL

MEMORANDUM

TO: Mike Tuccelli

FROM: Don Rhoten

DATE: October 24, 1989

RE: Doctoral research project

Sorry for the tardiness in responding to your request to conduct a research project within the school for the deaf. I've discussed this with Linda Prokes and we see no problem with granting permission to do this. However, before granting official/final permission, we have a few questions:

1. Exactly how many students would be involved with this?
2. Are all these students currently enrolled at FSDB or would some be included who have left the school for one reason or another?
3. When would your project begin and when would it terminate?
4. When would you access the files? During the school days or in the evenings?
5. What mechanism would you suggest to keep us informed of your progress and findings?
6. What are "other" variables that may be significant? That might be gleaned from the files?

I think you'll agree that its important that we keep a handle on research being conducted here, and who has access to student files. As mentioned in your memo, confidentiality is imperative.

I look forward to your response and further pursuing this with you.

cc: Ms. Linda Prokes
Ms. Nancy Stavropulos

APPENDIX B

PARENT PERMISSION FORM

Michael Tuccelli
Community Education
Florida School for the Deaf and the Blind
207 N. San Marco Avenue
St. Augustine, FL 32084

April 9, 1993

(Parent)

Dear (Parent):

I would like your permission to spend ten or fifteen minutes with your child (name of child) to test your child's reading ability using a test called Test of Early Reading Ability for the Deaf or Hard of Hearing. Basically, I will show your child a few pages of letters, words, and phrases and have your child sign what is on the pages.

The results are confidential and will not be shown to anyone, except to you, upon request. The results will not be in your child's records. I am doing my doctoral research on reading abilities of young deaf children and feel that the results will help improve your child's reading ability.

I plan to do this testing right after Spring Vacation. Please sign this letter in the space below and return to me in the stamped, self addressed envelope. Thank you so very much for your kind permission.

Cordially,

I give permission for my child to be tested as explained above.

____
(signed) (date)

APPENDIX C

DATA

DATA FROM STUDENT FILES AND TERA-D/HH TESTING

TERA/D-HH QUOTIENT SUBSCORES	AGE OF MOTHER AT BIRTH OF STUDENT	BIRTHDATE OF STUDENT	GENDER	RACE	IQ	HEARING LOSS	SKI* HI
72	33	9/10/87	M	W	65	-	no
86	29	4/26/86	M	W	89	profound	yes
86	21	8/13/88	F	B	127	profound	no
87	25	12/13/83	F	B	-	-	no
98	37	2/17/88	F	B	62	severe	yes
98	35	10/27/88	M	W	88	profound	no
99	28	12/07/83	F	W	104	severe	yes
102	33	12/18/80	F	W	101	profound	yes
102	24	6/17/89	M	W	-	profound	yes
103	26	6/13/89	F	W	-	severe	no
105	33	5/14/84	F	W	110	profound	no
105	42	10/10/88	F	W	-	profound	no
105	38	11/19/88	F	W	100	moderate	yes
108	39	1/11/81	F	W	-	-	no
113	33	5/21/88	M	W	108	profound	yes
116	41	4/14/84	F	W	126	profound	yes

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BIOGRAPHICAL SKETCH

Michael Anthony Tuccelli was born profoundly deaf on November 9, 1947, in Portsmouth, Virginia. After residing in several states and Venezuela, he settled in Florida at the age of 11. In spite of being deaf, he did not learn American Sign Language until he enrolled in Gallaudet College, which is the world's only liberal arts college for the deaf.

He enrolled in Gallaudet College after completing two years at Jacksonville University, where he was a biology major. At Gallaudet College, he received his Bachelor of Arts degree in biology in 1970 ranked #1 in his class. In 1974, he received his Master of Arts degree in special education at California State University, Northridge. In 1986, he received his Specialist in Education degree in education leadership at the University of Florida. Following graduation, he enrolled in the doctoral program at the University of Florida.

His career experiences have included being a medical researcher at the Blood Bank of Milwaukee; science department chairman at St. Johns School for the Deaf in St. Francis, Wisconsin; an administrator of a Jacksonville Urban League program; a mayoral candidate in Oak Creek, Wisconsin; principal of a private school in Wisconsin; teacher of science and mathematics at the Florida School for the Deaf and the Blind (FSDB); and Coordinator of Community Education at the FSDB. He is also an ordained evangelist in the

United Pentecostal Church International and is also active as a keynote speaker and conference presenter.

He is married to Christine Walensa Tuccelli, formerly of Milwaukee, Wisconsin. They have three hearing children, all of whom are fluent in simultaneous Sign Language and English.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Education.

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Phillip A. Clark, Chair
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I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Education.

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I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Education.

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This dissertation was submitted to the Graduate Faculty of the College of Education and to the Graduate School and was accepted as partial fulfillment of the requirements for the degree of Doctor of Education.

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